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APA-TECH 77

GT Buckfast: Audrey Helou, 2691 Roundtree Drive, Troy, Michigan 48083
Voice: (313) 524-3298, Data: (313) 524-9024

Table of Contents

Cover	1
Table of Contents	3
Transporter Topics	5
Dr. Gonzo's.. . . .	9
Der Mann Von Drüben	13
Congratulations! You've Decided to Clean the Elevator!	17
Crumberunchers, Inc. & Hobson's Choice	21
Dead Men's Letters	39
At the Last Possible Second...	51
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page count:	58

APA Policies:

- Minac (Minimum level of activities required) is two somethings per year.
- Issues will be mailed the first week of even-numbered months, so contributions must reach me by the first day of said even-numbered months. Things which reach me late will be held until the next scheduled mailing.
- The next deadline is April 1st, 1992.
- The copy count is twenty-two (22).

Your current postal account is: -1.18

Rolf, this will be your last issue unless I get both \$ and Minac before April 1st.

Roster

Scott Abfalter [63]	20920 Woodland Glen Drive, Apt. 201, Northville, MI 48167 (313) 344-1859
Guy Consolmagno SJ [47]	1331 West Albion Ave., Chicago, Ill. 60626 (312) 973-1158 ext. 412
Barry Gehm [55]	2541 West Eastwood, Chicago, Ill. 60625 (312) 588-6076
Christopher C. Bosh Gillett [64]	264 Randall Road, Berlin, MA 01503 (508) 838-2755
Gabe & Audrey Helou [61]	2691 Roundtree Drive, Troy, MI 48083 (313) 524-3298
Bill Higgins [17]	853 Lorlyn Drive, Apt. 1E, West Chicago, IL 60185 (708) 293-1050
Valli Hoski & Joachim Schurmann [13]	852 Henrietta, Birmingham, MI 48009 (313) 645-5868
Doug Hosto [62]	2700 Ambassador Caffery Parkway, #224, Lafayette, LA 70506 (318) 981-3169
Bonnie Jones [43]	4757 N. Kewanee, Chicago, IL 60630 (312) 736-2561
Bill Leininger [21]	15 S. Maple Lane, Prospect Heights, IL 60070 (708) 253-8614
Linda Matsushita [51]	Unknown.
Steve Popernack [64]	2873 Colony Woods Circle SW, Canton OH 44706-3371 (216) 477-3046
Dave Powell & Susannah West [29]	P.O. Box 98, 501 Main Street, Ripley, OH 45167 (513) 392-4549
Rod Smith [7]	730 Cline Street, Frankfort, KY 40601 (502) 227-7741
Bob & Connie Trembley [56]	25712 Bellair, Roseville, MI 48066-3963 (313) 777-0568
Rolf Wilson [28]	611 W. Hill Street, Champaign, IL 61820-3322 (217) ELYSIUM

TRANSPORTER
TOPICS

Rodford E. Smith
730 Cline St.
Frankfort, KY 40601
(502) 227-7741

Number 65

Well, I passed my karate test. Re-reading my last APA-Tech contribution, I am abashed to realize that I gave the wrong rank. Yodan is fourth degree black belt. I now hold a Godan, or fifth degree. Be nice to me.

The first part of my article on the Forerunner aircraft is in the latest issue of Pyrotechnics. I am working on part two.

Most of my fiction efforts lately have been devoted to completing the furry story I mentioned last time. Yes, I have actually joined the ranks of anthropomorphic writers, though not wholeheartedly. This was one of those tales (no pun intended) which demand to be written. I already have a fanzine editor willing to publish it, and an artist willing to do the art.

I have recently been transferred to a new job, much to my relief. My previous supervisor is a nice guy, but incompetent. The branch manager over him is a jerk, one of those micromanagers who requires detailed descriptions of an illness before approving sick leave. I am still in the same division, but under a different supervisor and branch manager. Ironically, because there is a shortage of desk space, I am still in the same location, adjacent to my previous supervisor's office.

It is a good thing, by the way, that this does not count as an actual change of position. I would receive an automatic salary increment for such, but would also be placed on probation for six months. Since the legislature is trying to blame the government employees for the fact that there is a sizeable budget deficit, there is a hiring freeze on and talk of, among other things, firing anyone on probation. The deficit was caused, by the way, when the legislators ignored the advice of their accountants and passed a budget which treated some income windfalls as if they were going to be there every year.

We recently passed a major milestone in my Gifted Saga role playing game. After resolving a long-brewing conflict, the Gifted have been told by wizards from other dimensions that there is too much magic on their world and it is causing problems for their neighbors. Half of them will have to leave. This little plot twist was inspired by a friend's comments that my proposed future history of the Gifted Earth worked very well as background for James H. Schmitz' "Witches of Karres." This was the last stop before a 1300 year advance in the timeline.

I thought I was weird, but the three teenagers in the gaming group have set up an extremely bizarre family arrangement for the future campaign. Between the two women and one man they have produced five offspring. One woman is a shapeshifter, and she has borne one of the children, and fathered another! (A girl, since

she can't change her genes easily.)

I am still teaching self defense to my small group. At least two of them have decided that they want to try for a rank this summer, when my instructor has the next round of tests. The others are going along with this, even though they probably won't test. Meantime, we are all having fun in the classes; them learning and me teaching.

I have another story which should be making an appearance in the Centaurs Gatherum soon. I sent the story to the editor, and he replied that he liked it. In the letter accompanying the story, I told the editor about Mercedes Lackey being the guest of honor at Rivercon next year, and he replied that I wrote better than her. I'm going to write back "Whether I am a better writer than Mercedes Lackey is a matter of opinion. That she is published professionally and I am not is a matter of fact."

Lately, my tinnitus has been bothering me for the first time in years. It finally occurred to me that I was also listening to a lot of music through headphones for the first time in years. I stopped, and the tinnitus stopped. The main problem is that my CD player has a phone jack, but no volume control. Anybody know of a good quality brand of headphones with a built in volume knob?

So far, the best deal I can find on flying to Orlando and back for Magicon is over \$300. If I can't get a flight for under \$200, I'll drive. As an added misfortune, two of my roommates have experienced financial reversals and dropped out, leaving just me and one other person. She has reserved a room at a cheaper hotel, just in case. If we can't pick up a couple more folks to share our room at the convention hotel, I'll cancel my reservation and share with her. If we can find a couple of partners, she will cancel her reservation. Clever, what? Her idea, by the way.

Mailing Comments

Joachim Schurmann: Yeah, I use my share of acronyms at work. Dealing with traffic as I do, I employ such terms as "ADT" (Average Daily Traffic), "VMT" (Vehicle Miles of Travel) and "DDHV" (Directional Design Hour Traffic). You can see how the abbreviations are useful in streamlining speech and memos, since the terms they substitute for are long and unwieldy. We also use the term "SOB" (State Office Building), which the people who work there don't like. (-: * The DDHV has been used for decades as way of showing the peak traffic in a day, which is what you want for designing turning lanes at intersections. Now, one contractor has declared that they don't understand what this term is or what the numbers stand for. Instead of telling these people to learn the terminology of the business, the folks in charge have told us to stop using DDHV, because it is "too confusing." Instead, we are to use separate AM and PM peaks, which is literally twice the work. And now contractors are calling us and asking why the two sets of peak figures show more traffic flowing one way in the morning and the other way in the afternoon! I'm very glad to be out of that part of the job. * It is a truism that the higher up in state hierarchy from which a request for information comes,

the less formal it is. Contractors and citizens asking for traffic counts or truck percentages must submit written requests by letter. Other peons in state government must use official memos. The Transportation Secretary just has someone place a phone call to our director. Yeesh. Then they complain that we didn't give them what they asked for. The reason we want written requests is so there are fewer chances for mistakes, and so we can provide evidence when the requestor complains that we didn't supply what was asked for. *

Crumbcrunchers: Would you folks be interested in attending Rubicon? This is a relaxacon held in Lexington, Kentucky every year in late January or early February. It is very small; we've never had more than sixty members. However, it is a lot of fun. It is held at the Marriott Griffin Gate, which has a jacuzzi big enough to swim in, and the hotel keeps the pool area open until midnight for the convention. I run the video room. (Which consists of my VCR set up in one of the two function rooms.) I also bring some of my Fablious Toll House cookies. By the time you read this it will be too late for this year, but if you are interested I will have your name put on the flier list for 1993. * How old is Dora now? My youngest niece (who turned 2 in December) has reached the point where she can produce words and short phrases recognizable to non-family members. Beth, by the way, is a prime example of the law that kids are just as cute as they need to be to keep their parents from killing them. (-: * You think finding possums in your garbage is bad, think about finding them in your basement! I killed 8 last year, two within an hour of each other. Now, during warm weather, I block the cat door at nights. Strangely, though I have chased several out, occasionally resorting to whacking their behinds with a stick, I have never seen one "play possum." *

Last Second: People keep telling me that I need to get a modem. Comments such as yours keep telling me that I shouldn't. That's all I need, another time consuming hobby. *

Marking Time: I hope you won't take this the wrong way, but your name reminds me of one of my favorite comic book characters, Herbie Popnecker. My guess is that his last name was inspired by one like yours. Anyhow, welcome to APA-Tech. * Will you be at Marcon? I am going for the first time in about four years, and hope to see a lot of old friends there. * That's interesting work you do, and some equally interesting background. The routine Jeff uses reminds me of the transcribing piano that [I believe] Irving Berlin (the author of "God Bless America" and lots of other goodies) used. He couldn't write music, so he would create a song and then play it on this special piano. * I have fairly good ears, and could probably develop absolute pitch if I worked at it. Unfortunately, I am also very sensitive to high frequencies, and am sometimes driven to distraction by computer monitors and noisy disc drives. * As part of my SF universe, I created the P'thaliani, whose vocal chords are plucked instead of blown. A group of P'thaliani in an argument sounds like a steel drum band

in a hailstorm. (-:


Reviews

Rocketmen: I recently traded for several tapes, on which are included three of the old Rocketman serials. I had seen some of these on TV back in the early sixties, and remembered them with fondness. The first is "King of the Rocketmen," which is very much like an old pulp SF-adventure story. In my opinion, this is the best of those I have seen. Next in the group I now have is "Radar Men of the Moon," the first of the Commando Cody series. The last is "Zombies of the Stratosphere," which has the added attraction of Leonard Nimoy as a Martian. Contrary to common myth, he did not have pointed ears and green makeup in this role. The Martians all wore hoods, so you couldn't see their ears, and the serial in black and white, so green makeup would have been superfluous.

Most of my book reading lately has been the "Arrows" trilogy by Mercedes Lackey. I had been warned that these were not as good as her "Last Herald Mage" books, and they aren't. In the first, "Arrow of the Queen," you can actually see how she learns as she goes along, and the next two also show steady improvement. Still, they are a good read, especially if you are less interested in polished style than in good storytelling.

In addition to Rubicon, described above, I will be at Concave at the end of February; Marcon in May; Rivercon in July; and Magicon in September. Hope to see some of you at some point in my journeys. I plan on bringing cookies to all events. (-:

The latest issue of "Air and Space" has an interesting sidebar accompanying one article. In the summer of 1957, several months before Sputnik, the US accidentally launched a man-made object on an escape trajectory. The item in question was the four-inch-thick steel cover over the opening to an underground nuclear test. Dr. Robert Brownlee, who was in charge of the project, knew the lid would be blown off, but after viewing the film taken by high-speed cameras of the cover's flight and making some calculations, he was astounded to come up with an initial velocity of six times that needed to escape the Earth's gravity! I wonder if this is what inspired Freeman Dyson to develop the Orion concept?

with anticipation;


Dr. Gonzo's

*Valli Hoski
to ApaTech, February 1992,
from the one whose books sit and wait at 852 Henrietta, Birmingham MI 48009
and whose telephone answers in the ether at (313) 645-5868.*

In all honesty, this should be a frank. But the news is fit to print, and the print will fit.

So take this in goodwill, know what's new with me and the unique life I share with Joa. For the record, this first appears in the Terrean, February 15, 1992.

The Origin of the Great Silence

The great Silence that has been heard from me in the past few months was a long time coming and hopefully, is a short time going. The major reasons for my lacktivity in most of everything are:

1) A deep melancholy that persisted all summer and fall, leading to extreme lethargy, sadness, exhaustion and intolerable anxiety this fall.

2) A real discrepancy in my professional position, conflicts between my interests, expectations, successess, and aspirations, my department's plan, direction, expectations and strategies, and the local office's key players' perceptions, philosophy and expectations.

3) A need to slow down the changes in my life and surroundings and just sit and look around. From 1987 on, I have lived or worked in Chicago Illinois, San Juan Puerto Rico, Milan Italy, Reggio Emilia Italy, Birmingham Michigan and Indianapolis Indiana. I have gotten plain and simply exhausted from change and the inconsistency of life, locale, time and space.

I. The Need for Stepping Discs

It might seen inconsistent. I just wrote above about excessive change in my life. Yet

here I go and make another one. But so far, it seems better than expected and definitely the right road to have taken. Simply put, I am now a manager with the firm of Ernst & Young, for the National Office in Cleveland, Ohio. My area of responsibility is still management consulting in professional and organizational development for both firm and client projects. My niche specialty is consulting for technology-based training systems and technology assimilation projects. Are those enough buzz words?

This is why you will find me on a client project in Indianapolis these days. It is a major systems project, involving 80+ team members with a 1000+ user community. The project development approach and work is similar in feel and flavor to what I've done for the past 8 years. New faces, new terminology, new protocols, but overall not a great culture shock. So far.

This is a change of city, people, habits. Yet, it is a controlled change. You could think of it as a sheltered change. I am provided with an apartment, car, other amenities of the consultant's out-of-town environment. My life and day is actually straightforward and structured. I know my responsibilities and assignments at work. I know my apartment will be taken care of. I know the structure and limits of my world. I am even getting to know local ham radio activities, a local professional association and might come to know some fans.

Indy itself isn't that strange (yet). Having gone to grad school at Purdue and Indiana University, I am reasonably familiar with Indy and even with Hoosiers. This state is weird, especially to a white, college-educated, liberal, kinda feminist woman like me. The northern part is agro-conservative,

Drivin' with my eyes
wide open
and my mind all
closed.

flat acres of corn, soybeans and flat-headed mentalities. The southern part friendlier, hillier, prettier, musical in spirit and heart and more cultured. (Can you tell that I disliked Purdue and loved Indiana U.?) Indy itself has gotten a lot more sophisticated and grown since 14 years ago. Downtown has life of its own, with restaurants, bars, boutique stores and bustling business headquarters. It still is surrounded by the core poor, but isn't devastated like Detroit. So, living down here just might be better than beating the snowstorms and ice on the Detroit freeways.

Why the stepping discs? That's back to Larry Niven again. Joa, my husband, is still on his project in St. Louis, which is a great city by the way. Still has spirit and spunk, ethnic neighborhoods, real midwestern people, Ted Drewes frozen custard (a true gift from the ghods) and a wonderfully reassuring solid, comfortable and real feeling of a people that are real and doing ok. So between St. Louis, Indy and Detroit, where will we be together on the weekends? Right now, St. Louis or Indy has my vote, but I am also very burned out on the conflicts that haunted me in Detroit. Southwest Airlines is the closest thing we have to stepping stones, but hey, their fares are almost free.

II. Unexpected the Expected

My great holiday adventure already proven that you aren't always where you think you are. Although I had planned to be traditionally in Detroit with my family for Christmas and Joa would be in Italy with his family, this formula did not predict reality.

This year we simply decided to be together, enough said. This meant I would go to Europe too, since his ticket was not refundable. If you know us, you know that individually and jointly we are rather strong-willed, competent and bright people. So of course we were able to find a travel agent who booked me a bargain fare and issued the ticket just 3 days before departure. No real magic involved, just persistence and a lot of time on the phone with travel agents. The key is to ask for ticket consolidator service through which unbooked or unsold tickets in charter trips, booked trips, group trips, etc. are made available through an agent at a decent fare. You also need to be flexible as

to exact departure/return dates and destination. For example, I wanted to leave 12/18-12/23 and return 12/30-1/4 and simply wanted to arrive at a major European city on the continent. I could then get myself by train or car to Milan. What transpired was a round-trip ticket to Frankfurt, 12/20-12/30/91. Joa and I then planned to drive from Frankfurt to Milan and visit some of his friends along the way. However, I could also just have taken the train to Milan from the Frankfurt airport, given that the airport has a train station beneath it.

The nonchalance with which I just described the international travel puzzle above is a little strange. That is what happens when you **think of the world as a lot of cities and neighborhoods connected by trains and airplanes**. It just isn't that difficult to be a world citizen these days.

Alright so maybe not everyone can/wants to go transatlantic, transpacific, trans-anything. But **go to Canada**, by plane, by train, by car, by foot. Get there, walk around, look at the cities, look at the people, look at the stores, the food, the books. You'll find more in common than you'd ever believe. Your neighborhood and that Canadian place you're in will never seem so far apart again. **Go to Mexico** (watch your wallet and the water). Look at dessert (sand) there, look at dessert (sand) here. Look at what they get by with there, look at life in small towns in the south here. Here and there won't seem so far apart again. **Go to Puerto Rico**, you don't even need to "leave the U.S." You won't need a passport but you might as well be in a foreign country. You are visiting South American and the Mediterranean countries without needing to exchange your money. You are still "inside" the U.S. but you are outside your home town and your home-grown assumptions. Yet that mailman picking up your palm-tree postcards is the same kind of guy who will drop it in your mother's mail box. **Your home country will never seem so homogenous or so "network standard" again.** Still, here and there really is not far apart.

We are global citizens not because of international treaties, economic blocks of nations, language or culture. We are people with hopes, fears, interesting stories to tell,

places to see, foods to eat. **We are each unique, yet we are uniquely in common looking at each other face to face.** Television brings the world home around the world, thanks to Ted Turner, CNN and others. Shortwave radio brings us information everywhere, thanks to the BBC and its powerhouse broadcasting World Service and others. We bring each other face to face through travel, TAFF, DUFF, Peace Corps, and a million and one gaping tourists each year. Go on, get out there to another town, talk to some other people.

III. Get Your Kicks on Route 66

St. Louis is a real Route 66 town. Life hops there on the Great Mother Road. If you're midwest American, you'll feel right at home. Even if you're not, you'll have a good time.

You've been reading my praises of St. Louis. Well, here are a few amusing vignettes from a weekend spent in the St. Louis time zone, where all calendars say 1967 but you still have the good bits of the 1990s. Most of them found along Route 66.

The Incredible Shrinking Dinosaur

Anyone remember Dino, the green dinosaur that was the mascot and logo of the Sinclair gas stations? Good news, Dino fans, he is living in St. Louis. Joa and I found him at a Sinclair gas station in the Chippewa and Gravois area. Sure enough, the little guy was still available to take home with you too. Dino is an inflatable dinosaur who stands about 2 feet tall and 2 1/2 feet long. He is a little plasticky but hey, he is made of the fossil fuels of his ancestors. His grin is as cheerful now as it was when I got my first Dino at age 4 (+/- 2 years).

I loved him then and gleefully recounted tales to Joa of one of my most favorite toys. One fateful weekend recently, Joa and I drove into the Sinclair station to gas up on our way to the Ozarks. Lo and behold, there is Dino grinning at us through the station's window. Joa and I had not found a gas station, we had found a shrine to the 60s. We got a bounty of neat stuff, all worthy of the Route 66 fame, including glasses with the Sinclair logo, a neat dinosaur sun shade for the car, and my pride and joy, a new

inflatable Dino. He stayed with Joa in St. Louis to keep him company while I'm away.

Dino is also a very responsive dinosaur. We surprisingly discovered his talents at "miracle dieting". We took him along on the rest of the drive to the Ozarks in a warm car, where he bounced along in the back seat in his plump, smiling, good-natured way. When we took him out of the car, he went on a crash diet in the Missouri cold evening, and lost his plumpness, indeed became rather withdrawn and scrawny looking. Once in the warm and toasty motel, he evidently likes the heat just like I do, and promptly became his pudgy, smiling self again. How many dinosaurs do you know that can do this incredible shrinking trick?

Miss Sherry's Horseradish and Pecan Pie

St. Louis has cafeterias like other cities have Italian beef joints, tacorias, coney islands and delicatessans. Miss Sherry's cafeteria on Route 66 feeds you well, your mother would approve. In fact, you might find your mother there. Ample steam table fare, decent to cheap prices, lots of friendly faces and you're a lot better off here than at McDonald's. These eaters aren't the fast food crowd, the sushi sophisticates or the nouvelle cuisine cadets. This is an older crowd, who might like the food for what it is (plain, simple and a bargain), for what the place is (a get together place with familiar faces), for what it reminds them of (comfortable, more believable and reliable times). Or they just have plain common sense and eat at Miss Sherry's because it's the wise, healthy and honest thing to do.

The corned beef and cabbage is great, but needed the horseradish to liven life up a bit. It's honest horseradish alright, no mambe-pambe cream sauce. Clears your nose, your eyes, your sinuses, makes you breathe real open and uncongested. If I was so foolish as to use too much, so that it melted right into the sauce and all over the cabbage, well good for me, I'll learn and know better next time. A person only needs so much horseradish; that's common sense.

Now the pecan pie. A pecan pie can't have too many pecans and Miss Sherry's has plenty. Sweet stuff, for sure, but why else would you eat pecan pie? Crunchy, gooey,

sticks to your teeth and you love every sweet second of it. Washes down best with milk, good for you too. The pie gives you a nice sweet smile and feels great inside.

Miss Sherry's: an honest meal that's good for you inside, from toes and tummy to heart and mind. Just like Route 66.

CQ, CQ, THIS IS NOVEMBER EIGHT QUEBEC VICTOR TANGO

Just in case you don't know yet: Valli got her ham ticket. She now owns a handheld two meter transceiver. I am an amateur radio enthusiast because I like the technology. Valli is in it for the talk: Ham Radio is instant companionship, just about wherever you go. I typically run out of words after the station identification and the basic radio related stuff. Valli recognizes the guys on the Catalpa and Hazel Park repeater by their voices. She also is one of the very few YLs (Young Ladies who are hams) in the area. This, of course, makes her well known.

Amateur Radio also adds to our family life: we have met on the air more than once. Just recently we discussed mundane things like shopping and dinner menu on the air. I had just flown in from St. Louis, and was driving home by car from City Airport to Birmingham. Valli was driving in from a client visit in Toledo, OH. Radio communication spared us the need to meet at home, decide about dinner and then leave again to go shopping. When we both came in range, "we met on the DART" repeater (146.640 MHz-). N8QVT asked KA9WGP to stop at a store and bring some food. KA9WGP suggested turkey steak and N8QVT agreed. Both N8QVT and KA9WGP exchanged their latest QTHs (current location) and ETA (estimated time of arrival). Thus I stopped over at a Farmer Jack's and got what we needed, Valli found time to refuel her car, and we both arrived home together: we practically met in the drive way. It could not have been organized better.

Another occasion brought us both to Toledo, OH. Valli had some work to do at a client site. Since it was a Sunday, I came along for the ride. Unfortunately Valli's time plan was entirely unpredictable, but both Valli and I brought our handheld transceivers. So we agreed to meet on the air when Valli was done. We agreed on a particular repeater and then split. It worked like a charm. Valli spent much less time than she thought at the client and could let me know right away that she was done. I got the car washed, and was just coming out of a "Target" store when the call reached me. Thus I went and picked Valli up and we had the rest of the afternoon together in Toledo.

I am sure that the hams in our area occasionally get to smile at some of our on-the-air domesticity. Better yet, non hams get their share of exposure too. When we go places, we have our radios with us, and they do show. Mine is clipped to the belt. We go shopping that way and we go to the restaurant that way. I am sure that to some people we look like undercover cops. Valli had her radio at work too and one day showed it to one of her more technical coworkers. "Amateur what??" Eyes glazed over. "Why would you do that, that's what cellular telephones are for." Oh well, it is not easy to get understanding for the fascination of amateur radio in the corporate world. I have been luckier in this regard. I got to talk about amateur radio with a partner of our firm. I explained to him that Amateur Radio was about as important to me than Golfing was to him. Inevitably we talked about business contacts and networking. When I pointed out that my Radio Club in St. Louis was sponsored by MONSANTO, that we had a repeater on the RALSTON PURINA building, and that our chief technician was one of the directors of the local power company, I think he understood that there was more to Amateur Radio than just a bunch of overweight tinkerers exchanging inanities of the air. However, he really preferred playing Golf. And that's ok; I prefer ham radio.

LAST BOOKS READ...

>Joe Haldeman - The Hemingway Hoax (Avon Books, New York, 1991)<

Somewhere between fiction and science fiction. Great challenge for Hemingway lovers: plenty of references and innuendoes. Parallel worlds with a new twist. The author had an inspiration, but ran out of it before reaching the end of the book. Stop reading on page 130: you will sleep better. Recommended if you like Hemingway, or Haldeman, otherwise don't bother.

>The Journal of Don Francisco Saavedra de Sangronis 1780 - 1783 (University of Florida Press)<

The title says it. But not all. This book is as riveting as a modern novel. It covers the Spanish campaign to the Caribbean, South America and the siege of Pensacola. Uneasy alliance with the French, war with the English. Not bloody, but not merciful either. Factual and concrete. Casualties, illnesses, logistics, communications and intrigues. Journal-ism at its best, in the true sense of the word. Recommended, unconditionally, unless you can't stand history.

BOOKS I'D RATHER NOT HAVE READ...

>TERRA! - Stefano Benni (Pantheon Books, New York, 1985) <

Weird, weird, weird! Its so weird that it rates more as a spoof on science fiction than actual science fiction. A hodge podge of eccentric ideas loosely held together by a thinly woven storyline. Intelligent mice, stubborn computers, baby geniuses, psychopathic telepaths. The ending? I have no idea, I never got there. You must like unusual stuff to finish this book. If you like Hitchhikers of the Galaxy you have a chance. If you don't, no dice.

>The Business Value of Computers - Paul A. Strassman (The Information Economics Press, New Canaan, 1988)<

Paul Strassmann is the Director for Defense Information. DoD's CIO. The book delves into the mistakes of the past: how not to select computer systems and squander your employer's money. It dwells on the past, but there is no recipe for success. I stopped reading the book when I met the guy. Great entertainer. Jovial, smooth and never wrong. Love to meet him over a glass of "Heuriger" in Grinzing discussing the fate of the world, but not in a boardroom, giving orders. If you research failures in Computer History, this book is a must, otherwise, any text about business reengineering will do better.

See you around

Joachim

Note for you technophiles: I begun writing this text on a COMPAQ LTE using WORD for WINDOWS. The LTE is somewhat awkward and bulky. Thus I electronically uploaded this text to my PSION MC 400 and completed it using PSION's native editor. Than I transferred this text to my stationary COMPUADD 320c from where I uploaded it electronically to Gabe and Audrey's BBS. Final editing: courtesy of Audrey Helou on Ventura software.

Congratulations! You've Decided to Clean the Elevator!

W. Skeffington Higgins

More pearls from the long-silent W. Skeffington Higgins, 853 Lorlyn Drive, West Chicago, Illinois 60185. Phone: (708)293-1050. Electronic mail: higgins@fnal.fnal.gov This is another Spinhairiscope Media publication, for Apa-Tech 77.

Well, I apologize for the long absence, caused partly by Worldcon but mostly by Not Having My Act Together at the time of various Apa-Tech deadlines. I will do better, I really will. I got this one in, didn't I?

Newton's Minutiae Can Be Yours If You Act NOW!

Last January I received the most wonderful piece of junk mail to cross my desk in a long while.

(And I get a lot of junk mail. I get *Aviation Leak*, so my name is sold to the Crewcut Republican Weapons Engineers mailing lists. I also get *Whole Earth Review*, so I am on the Organic Hippie Relics of the Sixties mailing lists.)

"Dear Scholar: (hmm, I like these people already)

"...a new microfilm collection, *Sir Isaac Newton: Manuscripts and Papers*, will soon be available from Chadwyck-Healey.

"...Going beyond the works of physical science, all of Newton's interests are revealed in this collection; his theological histories, economic analyses, experiments in alchemy, geography, interpretations of mythology, commentaries on Scripture and medical treatises.

"Your institution can acquire the complete collection at a *pre-publication price of \$4,500, if an order is placed before February 28, 1991*. After this date, the price rises to \$5000." (Gee, it isn't every day that somebody offers to save me five hundred bucks! I begin to daydream. The entire extant works of Newton... I would be the only kid on my block to own them... I could do all kinds of scholarship... how much limit do I have left on my Master Card?)

"Please examine the brochure enclosed. If you have further questions regarding the collection or would like to place your order with us, call our offices in Virginia toll-free at 800-752-0515."

It didn't take long before I came to my senses. But, you know, once you've considered a \$4500 impulse buy and rejected it, a lot of other things look

less frivolous. I've begun to think about the \$500 Phobos globe from Germany again. (-:

(Why did I get this particular solicitation? I think it's because I am a member of the American Physical Society's History of Physics division.)

The Navy Goes to (Video) War

Here's a disturbing glimpse into the New World Order. On page 55 of the 23 September 1991 issue of *Aviation Week* is a report of the U. S. Navy's agonizing reappraisal of its relationship with the press. Apparently, during the Iraqi conflict, the Air Force got much more TV coverage than the Navy. Naval veterans were asking, "Why didn't we see them on CNN like we did everybody else?"

"The primary Air Force strike fleet—F-117As, F-111s, F-16s, and F-15Es—had simple, yet high-quality video recorders installed in their aircraft," the *AvLeak* story goes on. "A Navy official said, 'As the engines were winding down after a flight, some [Air Force] public affairs officer was presenting the results of that strike to CNN, and you were seeing it in your living room before the debriefing was completed.'"

Alas, though the Navy's precision bombing was second to none, their planes had inferior VCRs aboard, and the video from them (good enough for military purposes) was not good enough to broadcast. "As a result, the Navy and Marine Corps have initiated a 'fast-track' program to get modern recorders in their front-line combat aircraft."

Wow. You need guns. You need smart bombs. You need to have all-weather, look-down, shoot-down, radar, and good ECM to keep the other guy's missiles off your tail. But, not for the first time in history, we find that the Navy has equipped its planes to win the *last* war, some Seventies battle where what you destroyed and how accurately you hit it was the important thing.

On the real battlefield of the Nineties (the Media Landscape), against their real enemy (the U. S. Air Force), the Navy has suffered a serious setback. The admirals overlooked the importance of Image in winning the hearts and minds of freedom-loving people everywhere (but especially in Congress). Not that they haven't had their victories too—notably *Top Gun*.

Don't worry, though. Our sailors are tough, and they'll bounce right back. I see the helicopters landing in the parking lots. I see the grizzled CPO crew chiefs sprinting into the doors of Highland Appliance and Monkey Wards, brandishing fresh purchase orders. I see the spit-and-polish parade of Marines loading camcorders and VCRs aboard the idling choppers. There they go, back into the sky, heading out over the sea for rendezvous with the Fleet. Is that "Anchors Aweigh" playing over the soundtrack, as the squadron dwindles to black dots across the sunset sky?

Or is it "You Oughta Be In Pictures?"



We're Not All Skeffingtons

So lately I've been reading *The life and work of William Higgins, chemist, 1763-1825* by T. S. Wheeler and J. R. Partington (Pergamon Press, 1960). I've only recently discovered that Ireland produced a prominent chemist with my name two hundred years ago. I looked him up in a book of scientific biography (a big one—Asimov has nothing to say about him), then tracked down this book through the awesome magic of Interlibrary Loan.

William Higgins was (probably) born in County Sligo, apprenticed to his physician-chemist uncle Bryan, and eventually went off to study at Pembroke College, Oxford. He spent most of his career in Dublin, working for the Royal Irish Academy and for the Linen Board. As an expert on dyes and bleaches he consulted frequently with Ireland's textile manufacturers.

In the excitement of late 18th-century chemistry, Higgins was a firm "anti-phlogistonist," and in 1789 he published *A Comparative View of the Phlogistic and Antiphlogistic Theories*. (This was the same year that Lavoisier published an account of his own experiments, which really delivered the death blow to phlogistic theory.) Historians are interested in Higgins because, in his arguments against phlogiston, he made use of the proposition that chemical substances

are made of atoms.

Twenty years later, when the color-blind British chemist John Dalton proposed his detailed atomic theory, Sir Humphry Davy mentioned that Dalton's work reminded him of Higgins's book. In a new book, *Observations on the Atomic Theory and Electrical Phenomena*, Higgins in 1814 pressed his claim that he, not Dalton, was really the father of atoms. But the majority of scholars at the time (and since) disagreed.

No, I don't know whether William Higgins the 18th-century chemist is related to William Higgins the 20th-century physicist; nevertheless I find him interesting. I'd like to buy my own copy of the book, but that's a rather hard problem. (The book does include lots of genealogical material.)

Another curious detail: William Higgins left his estate to his nephew, Capt. Charles Higgins, and it was shared among Charles's daughters, including Emma Julia Higgins. In 1867 she married one William Peel. Yup—William Higgins was a great-uncle of Mrs. Emma Peel!

Hog-Butcher-For-The-Worldcon Five, Egoboo Department

I annihilated the summer of 1991 working on the World Science Fiction Convention, Chicon Five. The Chicago folks asked me to put together the science track. I wound up with about *ninety hours* of panels and talks—probably too damned many, but the Chicon management indulged me.

There were difficulties, like a difference of opinion with the chairman, but I won't go into that just now. Buttonhole me sometime. For the most part, my program ran smoothly and was well attended.

I was pleased to receive praise from a number of friends and strangers on the computer networks. I hope they won't mind if I quote from them.

From Kenneth J Meltsner:

I think Bill Higgins deserves a public congratulations for his work on the science programming. It was informative, interesting, and fun – and a lot of people attended. I even saw about 50-100 people for the panel I was on at 10 am on Friday! I suspect that Bill has set a new mark for science programming at Worldcons.

From Evelyn C. Leeper:

More than that, he deserves a special Hugo! Great job, Bill!

(The only problem was that Mark disappeared every day at 10 AM and resurfaced at 6PM for dinner, bleary-eyed and babbling about how SF doesn't deal well with death in the failed dreams of yesteryear on the way to Vinge's singularity. :-))

From Ed Rush:

I agree. I found myself going from one fascinating session to the next, trying to find a little time for the rest of the con. (I finally got to the huckster room on Monday afternoon!)

If Charley "Locus" Brown can keep getting Hugos year after year, surely there should be a way to give one for outstanding ConCom work!

From Mark R. Leeper:

You did this to me!... Evelyn referred to this as the convention at which I disappeared at 10 am and wasn't seen again until 6pm. If the convention were being rerun this weekend I could go to an entirely different set of panels and still keep busy. About two-thirds of the programming I went to was science programming which is usually very skimpy at Worldcons and at this particular con was nothing short of spectacular. I consider this to be maybe one of the three best Worldcons I have attended (I must have been to about 17 or 18 by now) and that is almost exclusively due to the science program. Thanks for a really good time and for a job very well done.

From Christopher Dunn:

I too believe Bill did a great job! Attaboy Bill! The man put a lot of work into setting the Science track up, and even got me to be part of one of the panels. (Got to meet Cliff Stoll, so that was fun.)

Bill - Bravo Job!

From Henry Spencer:

I agree. Despite occasional mutterings about how the two most fascinating items of the day were scheduled opposite each other :-), I was most impressed with the science track.

From Teemu Leisti:

Things like color separation of video transmission and too much free beer seem pretty minor to me when compared with everything that went right, and let me once more congratulate Bill Higgins on the science program here. (I got a chance to applaud him on the panel on Vinge's Singularity, which I think is techno-rapture, as someone "guilty" of saying that was quoted on the panel. When Higgins suggested that there *might* be, errr, *dangers* involved with some technologies, the whole audience was stunned into silence as the tone of the services was rudely interrupted. :-))

Mailing Comments on Apa-Tech 73

Rod— Without having read your story, I must say that I think "Murder at the Shapeshifters' Ball" is a great title.// Disappointingly, I got no feedback from true cranks after I posted "Higgins vs. the Saucer People." I did have to straighten out a couple

of confused people who thought my discussion of antimatter, palladium rods, muons, and alien spacecraft might be serious.

Susannah— Re the 1915 schoolhouse in Ripley: What's "Jacobethan architecture?"// Most of the adult Space Camp alumni I've known were really, really glad to have gone. I haven't met many kids who've been there, but they seem to find it very rewarding too. I wonder if it isn't cruel, though, to raise a child's expectations about spaceflight... seems that a lot of our generation (including essentially all Apa-Tech readers) have been disappointed, nay, bummed, at the glacial pace of astronomical progress. We were promised so much *more*.// Re editing: "This convinces me... to accept only stuff that needs the minimum of editing." I understand. Last year I put in a horrendous number of hours editing a *Pyro* article (no, I won't say which one, not in print anyway). Made me appreciate how I've been taking well-written material for granted. Most of the stuff we get is pretty publishable, at least by fanzine standards.

Audrey— What's the second program you buy, after you buy a spelling checker? One thing that seems sorely needed (and I understand that versions of it have appeared on the market) is a Homonym Finder. I see it as a program which locates a potential homonym in your text. For instance, "there" could be correct, or maybe you meant to write "their." The H. F. then presents you with two or more alternatives for the word, along with short definitions to help you distinguish what you *really* meant to say. Such a program would clean up many of the problems that appear in spell-checked text. (Sorry. I just couldn't bring myself to write "spelling-checked" or "spell-checked" when "spell-checkered" seemed like so much more fun to say.)

The Homonym Finder would not be much help to those poor souls who haven't figured out the difference between "it's" and "its." So how do we design a computer-assisted "itpicker?"

Another thing I've occasionally wished for is an English translator. I could write in my native American, pour the text file into this processor, and out would come the same text in perfect British orthography (you know, "colour," and "centre," and all that).

Re Randi: Barry Gehm has a copy of *Flim-Flam*. It's a pretty good book. Perhaps you're aware that Uri Geller, Boy Spoonbender, is suing James Randi and CSICOP for libel to the tune of fifteen megabucks? See *Scientific American*, September issue, page 39, for details.// Re the Howard Rheingold article: Howard is editor of *Whole Earth Review* these days, which, as a hippie *manqué*, I read avidly. (Well, the fact that

I made my first sale to that magazine *does* increase my fondness for it.) Howard's new book, *Virtual Reality*, looks good, but I'm waiting for Bill Leininger to publish a review of it (hint, hint). The *Chicago Tribune* reviewer thought it was too techno-optimistic. VR is the hot topic of 1991 and early 1992, and you will be sick of it soon if you're not already. This is only the first in a long string of books dealing with it.

Gabe— You skirt the answer to something I've always wondered: What does a BBS operator *get* out of it? It seems like you put your time and trouble and hardware and phone on the line (literally), but what is the reward that makes it worthwhile? In your case, you wanted to receive and give away free software. Is that the major motivation for most sysops?

You suggest submitting Apa-Tech zines by electronic mail. Not the first time it's come up—but perhaps this is the closest we've ever come to making it practical. I generally write my zines in LaTeX for typesetting. I could do them in flat ASCII and ship 'em over to Detroit. But you'd have to print them out somehow; do you really want to do typesetting on my zine?

I also like to leave some space on my pages to draw in a cartoon. I'd have to forego the cartoons, or papermail them on a separate page, if we were e-mailing the apazines.

I count eight people on the roster who can be reached from an Internet node. That leaves six poor souls who are Off The Net. I guess we're not quite ready yet to turn Apa-Tech into an on-line discussion group...

Doug— One of my best buddies in college was from Lafayette, Louisiana. Sounds like a decent place, though I've never visited.// Thanks for the details on well-capping in Kuwait and Iran. Nasty business; I'll stick to particle beams, thanks!

Scott— Welcome. There are serious flaws in the story fragment you gave us. Since nobody else in the apa has had the guts, I'll comment.

Your greatest strength is that you have a very clear idea of how the spacecraft operates and what happens in combat. You also have some novel ideas. I liked the notion of multiple AIs co-piloting the fighter. I also liked the notion that Anton can get extra performance out of his ship but penalizes his backup systems, suggesting that he does a sophisticated tradeoff calculation to get out of a tight spot.

Here are some of the problems you should consider:

- You say "Anton perceived nothing but the cyberspace continuum" while jacked in. I think this is a mistake.

You are depriving yourself of many of the tools a writer can use to build character and action. Sounds, smells, and other sensations can help the reader to imagine Anton's experience. What does his ship smell like? Is there sweat rolling off his forehead? Is he cold or warm? Any muscular tension, or odd feelings in his stomach, as he goes into combat?

- You have *no* dialogue whatsoever. Why not? There are other pilots in Anton's flight. There are also at least two AIs aboard with "human interfaces to interact with human beings." They should be talking to Anton. Ideally their conversation, consisting only of things they naturally would say to each other in a space battle, could *at the same time* convey to the reader a lot of information about what they're doing. You could also give us thoughts of your protagonist as he "talks to himself." This would enable you to get rid of the...

- Big blocks of description. Paragraph 1 is image. Paragraph 2 is more visual image, expanding only a little. Paragraph 3 is more description, and could be dropped completely. Paragraph 4 offers some exposition of the story situation. Paragraph 5 is the meat of the exposition—but it gives a confusing account of the time sequence and it's jam-packed with sentences in the passive voice, which should be avoided, I mean, which you should avoid. Paragraph 6 further describes the cyberspace equipment. Paragraph 7 is all hardware. Paragraph 8 is hardware and numbers. Paragraph 9 makes an interesting point. Paragraph 10 has a stultifying recitation of numbers. And so forth. Much of the material you provide is stuff the reader really doesn't need to know to understand the story's action. Throw it out. Use dialogue or internal monologue to help deliver the rest, and the amount of straight description or exposition you need to give us goes way down.

- You have a pretty vague grasp of the use of apostrophes and hyphens in English prose. This can be fixed. Study up.

- You need an itzpicker (see my comments to Audrey above).

- Decide whether your narration is in present tense or past tense. You employ verbs in both tenses.

- There are a fair number of misspellings and singular/plural problems, but I presume you can fix those, too.

- "The missile exploded three kilometers from the ship," a solid, short, active-voice, action sentence, is followed by "Anton's ship suffered a major system failure." What a letdown! No further description. (In the next sentence, Anton ejects.) This is a curiously understated way to describe the climax. Was there a sound? Vibration? Shock? What did Anton feel? And what went wrong with the ship? You un-

derstand every nut and bolt on it—we know that from your extensive description in earlier paragraphs—but you won't tell us what broke. It might also be effective if you painted a clearer picture of what Anton experiences when he's suddenly disconnected from all that fancy cyberspace and AI equipment. (Possibly some more primitive cyberspace gear remains in the escape pod?)

If you want to continue work on this story, you should read a book or two on "how to write fiction," and think while you're reading about how to apply its techniques to your story. Good luck.

Mailing Comments on Apa-Tech 74

Rod— Sounds like your fiction writing is creeping up on success, collecting progressively nicer rejection letters. Good luck.

Susannah— "A guide to practice management software" for doctors and psychologists: sounds like something that would be tricky to market. I'd be interested in hearing how Dave and Ed sell it once they finish it.// Interesting remarks about bookstores. A Real Bookstore will order the books you want for you. Big chains are driving them out of business, or at least making life hard for them. Though good chain stores like Walden's or Kroch's will order books, too. I try to buy from Real Bookstores when I can. But it's hard to resist snarfing up those remainder bargains at Crown Books. So what do you think of *Trillion Year Spree*? I am now reading the competition, *The World Beyond the Hill* by Alexei and Cory Panshin. Both books have convinced me that I should read more H. G. Wells.

Bob— Good to see you back; keep writing! (And how soon before Rachel joins the apa?)// Re Low-Life Foobs: I think that cartoon was reprinted in *PyroTechnics*, probably in the Hart Regime. Early eighties? I think George Ewing dug it up.// As an editor of *Pyro*, I would prefer that we don't reprint previously published material. (Though I admit the zine has done so in the past.) So I would frown on your submitting the same piece both there and to Apa-Tech. The other editors may talk me into running it, though.

Audrey— "Ifversen" is spelled with an "f." You left it out of Doug's name. I wouldn't mention such a typo, except that poor Dave and Doug get their names misspelled a *lot*.// The South Eastern Michigan Gluttony Society (SEMI-GLUT) sounds nice. I was pleased to attend your chili night at Virginia & Gary's house on Conclave weekend. The major focus for my piece of Chicago fandom was for years the gathering known as Thursday Night. It wandered from apartment to apartment, and was the perfect occasion to exchange gossip, borrow and return

books ("I'll bring it to Thursday,"), arrange rides to the next con, and garner fannish information (including the location of the next assembly, hence the cry "Where's Thursday and when's Boston?"). Alas, Thursday folded several years ago. It's sorely missed, since there is no such nexus to serve all these needs today, and one now and then hears rumors that some Son of Thursday may arise in Chicago...

Gabe— Thanks for the Berserker report. Even though I was present that weekend, there was so much going on that I couldn't be everywhere, so it's nice to read about your experience. Hope you'll do a Worldcon report!// I missed the Suomi Restaurant this time around. But it was fun to share anchovy pizzas with you at the Library. Let's do it again.// I was quite surprised that the "Patriot" flew as high as it did (not very), as you can tell from viewing the videotape of the launch. Julie Skirvin has been busy editing the Berserker footage into a documentary laced with music videos. I can hardly wait to see the final product.// Nice Earth graphic. But (I have been known to torment salespeople in stores that sell globes) is this the *only* planet you've got?

Scott— Your preface said:

1. I think I should tell you something about myself.
2. I have this story.
3. I like H. P. Lovecraft.

I'm afraid 2 and 3 don't deliver very well on the promise of 1. I look forward to reading more personal information in future mailings.// One of the characters in your story, Kevin Anderson, has the same name as a contemporary fantasy author. You might want to change that! Anderson is the co-author of *Lifeline* with Douglas Beason, and has published a series of RPG-oriented fantasy novels, (you know: gamers suddenly found that they've fallen into the world of their D & D campaign. Yuck.) the titles of which escape me at the moment.

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January 1992

How weird to write 1992! There's now no denying that we're in the final decade of this century! (I find myself remembering my grandparents' reminiscences of the time when the 19th century turned into the 20th! My grandmother - who'll turn 102 next month, by the way - was 10, my grandfather 15. Or if you belong to the school of thought that says the 21st century won't begin until 2001, they were 11 and 16, respectively.)

Since I mentioned my grandmother in the last paragraph, I'll give you an update on her. Some of you may remember my account of her big 100th birthday party which she had two years ago. (My parents hosted an open house which they intended to have from 2-5 in the afternoon. Well, people were still stopping by at 7 PM with their good wishes!) She's much feebler now, and needs both my parents and an aide (who comes in three days a week so my parents can get out to do errands and their volunteer work) to care for her. Her general health, though, is quite good - my parents are very careful to monitor her diet to take into account all the things she can't eat. Actually, they're all eating low-salt, milk-free food, which sounds very boring, but my mom is a very creative cook, and is able to keep things interesting.

My grandmother spends part of each year in Corvallis, Oregon, where her older daughter lives. According to my mother, she plans to return to Oregon in about a month, if her health permits.

I've been thinking about caring for aging relatives a great deal since my grandmother started living with our family. This was when I was in college, so I was actually only a part of the family during the summer, but I nevertheless felt that it really impacted on my life, because my grandmother took over my bedroom and I had to move in with my younger sister, who resented having to share a room as much as I did. I know that sooner or later I'll have to face this painful question myself. My sister (who's three years younger than I) is already facing it, since her mother-in-law, who just turned 86, and who's almost completely bed-fast, has moved in with her family.

Nothing much exciting has been happening in Ripley lately, though I will tell you that our ex-mayor still has his bear! (We saw it riding around in the back of his truck the other day.) Dave's SPECTRUM is at the photo-copy shop; my HOBSON'S isn't, though, since my checking account balance is still pretty low. If I could only solve this money problem, I'd have no problem with bringing out an issue each month, especially as I have three of them all set to go right now!

Dora has been progressing by leaps and bounds, as befits a one-and-a-bit -year -old. She learned how to unscrew the tops off her bottles and tip their contents (milk, juice or water) over on herself, so she's almost completely graduated to drinking out of a cup. She gets really impatient with bottles, but still acts a bit suspicious of cups and will take only a few sips before she abandons one. She likes straws, however, and will readily drink a whole glass of liquid if she's provided with one. (She's also learned how to blow bubbles through a straw - I suspect from watching Marlene.)

She's had interesting adventures, some of which I can't figure out. One morning, for example, when I got up, I found ~~that~~ her crib (which is a soft-sided Fisher-Price "Travel-Tender" portable bed) lying on its side. She was sleeping peacefully on the floor in a tangle of blankets. I'm at a loss to know how the crib managed to get knocked over without my hearing its falling, or her waking up and making a fuss when it fell. I also can't figure out how she managed to fall into the bathtub the other day while Marlene was taking a bath. (I was, after all, watching her all the time!) She just all of a sudden slid right in, probably when reaching for the bottle which she'd just dropped in the water. She went all the way under the water and bobbed up right away, not even upset by the experience of having her head under the water and getting entirely soaked! She gets in all sorts of dangerous situations, and seems to have no fear, unlike Marlene, who was much more cautious at the same age.

Our animal adventures lately have been mainly confined to mice. Living in the semi-country as we do, we are overrun every fall, so have to have a serious mouse-catching plan. I have traps set all over, in what I think are fairly inaccessible places (although Dora's curious little feet and legs will probably lead her to them sooner or later, and then we may have to cope with little fingers caught in traps) and was catching three or four mice every night for awhile. This has slacked off considerably, though I know there are still many mice about. Just when I think I've rid the house of mice, of course, the river will rise, and more mice will come into the house to escape the flood waters - then we'll have a new plague of mice!

One other animal which has turned up in our basement is a meadow vole, which Dave calls a "micro-mouse." This animal is smaller than a mouse, and has only a tiny stubby little tale, but is the same color as a house mouse, and flicks around next to the walls in an elusive manner just like a mouse.

During the holidays we had the chance to get together with some of Dave's sisters. They all look at Dora and say, "She's still blonde!" and "Where did she get the blonde hair?" Her eyes are still blue, too! I know that when Marlene was her age, her eyes had become brown, and I've read that babies' turn the color they'll be by the time the baby's six months old. (I take this with a grain of salt, though, as Marlene's eyes were still blue at six months.) There are definitely blue-eyed blondes on my mom's side of the family, but Dave can't recall any on his side. There must be some, though, as I seem to remember that blue eyes are a recessive trait! (Update - Marlene was quick to notice that a very close Powell relative DOES have blue eyes - none other than Dave's Uncle Ernie Powell. We'd only met Uncle Ernie once before, so the blue eyes had escaped our notice.)

In order to share some fun SF (and NF too) with you, and also to solicit your opinions (!) we're enclosing an issue of our little magazine. Those of you who were at the 1988 Ishercon may remember that we promised this to you back then - well, here it finally is! (Thanks for your patience!)

The "Life and Times" column was inspired by Bill Higgins, who said he really enjoys reading about what the creators of a zine have been up to. Some people feel it's sort of ho-hum, though - so we want to know what YOU think.

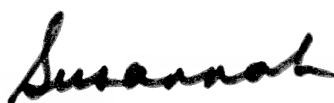
Cartoons - what's the general feeling about them? As I mention in the editorial, the response to the toons in issue #1 was even less enthusiastic than ho-hum. I don't really understand this, as I've always enjoyed cartoons myself. If you can explain, please do! (Of course, it may just be the irritation of those who want more stories and less "filler". However, the people my age and older with whom I shared the first issue found several of the cartoons "hilarious" whereas the younger readers - college and high school age - thought they were just "stupid.")

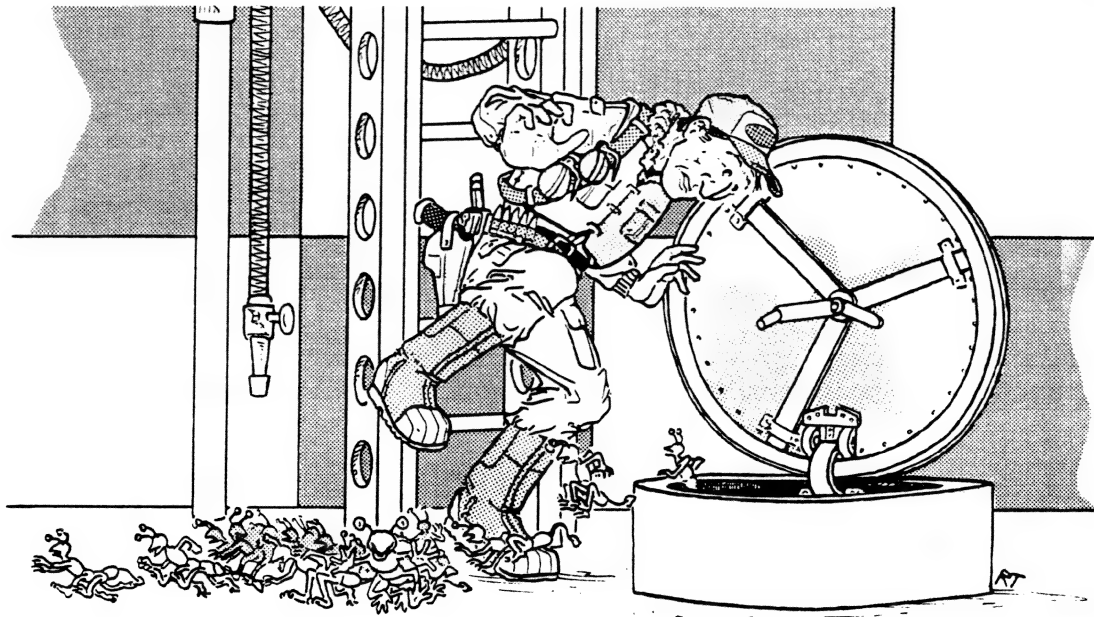
What do you think about format? We've gotten both positive and negative comments - some folks would like to see it more digest-sized, others like the larger size and easy readability.

How about the illos? (Next time all photos will be screened!)

This particular issue has no advertising, but the next one probably will. How do you feel about advertising - do you find it offensive or is it acceptable?

Remember, we want to KNOW WHAT YOU THINK. We'll probably share a HOBSON'S with you every once in awhile to get an idea of how we're doing.

A handwritten signature in cursive script, reading "Susannah". The ink is dark and the handwriting is fluid, with a long, sweeping tail on the final letter.



"A swarm of wirebugs fled from the shaft" - "Cellarman" by Kurt Hyatt

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science fiction & technology

FEATURES

Robots for Space: Why Build Machines in Man's Image?... by Betty Nolley	2
Toons... by Ed Koca	7
Cellarman...by Kurt Hyatt, illustrated by Richard Tomasic	9

DEPARTMENTS

Additional Reading	15
Life & Times in Ripley, Ohio	15

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David F. Powell

Managing Editor
Susannah C. West

Submissions Editors:
Jeff Derenne
Kay Fortunato
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Anneliese Raab
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Rose Secrest

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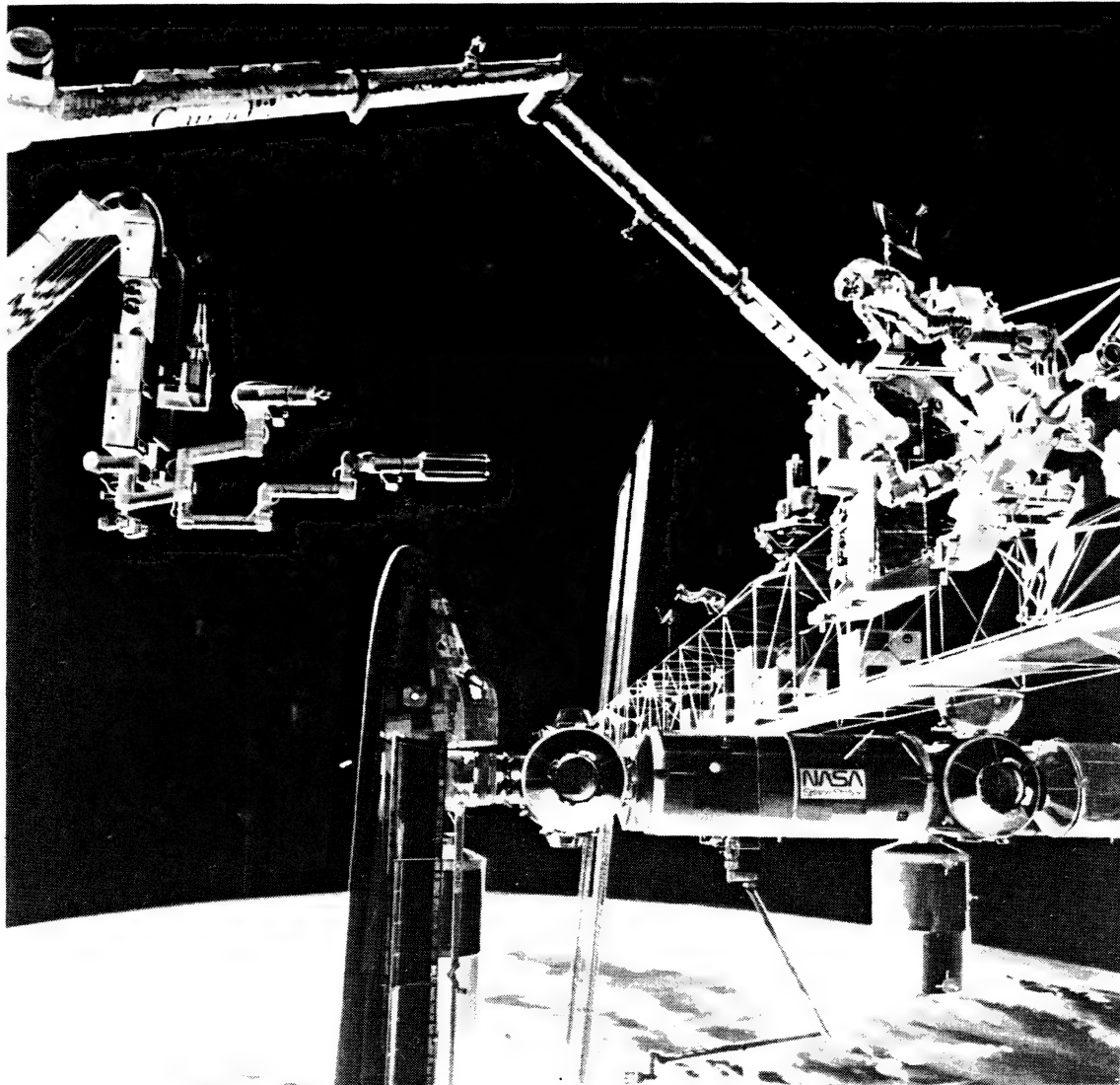
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NASA artist's representation of Mobile Servicing Center and Space Station *Freedom*

The word robot was coined by Karel Capek, a Czech dramatist, in his 1921 play, *R.U.R.* (Rossum's Universal Robots). Capek's androids, though they freed humanity from labor, eventually revolted and destroyed their masters. From this Frankenstein-like beginning, the idea of machines that imitate humans was extended by Isaac Asimov in the *I, Robot* stories by the addition of the "Three Laws of Robotics" that enforced human control over the superior androids.

Though human-like robots are still beyond present capabilities, intelligent, anthropomorphic automatons would be perfect for space operations. And according to NASA scientists and engineers, robotics will play an important part in activities onboard Space Station *Freedom* and in future space exploration.

Robots for Space: Why Build Machines in Man's Image?

by Betty Nolley

Though NASA's plans are currently in a state of flux, Houston writer Betty Nolley stays atop space program developments. At the present time, work on all the robots described in this article continues, and robotics will definitely play a role in NASA's future.

*Betty says she's been a science fiction fan ever since she first read **The Martian Chronicles** in high school. Her articles on the space program have recently appeared in such magazines as **New Pathways** and **Ad Astra**.*

Using robots in space is not a new idea. Robot machines have actually played a role in the space program for some time. For example, deep space probes like the Vikings that landed on Mars, the Soviets' Venera series that penetrated Venus' atmosphere, and the Pioneer and Voyager spacecraft that toured the Solar System, possessed robotic abilities.

These machines were, however, directed from Earth and were not anthropomorphic. Robots currently being developed, on the other hand, *will* possess anthropomorphic characteristics, and in some cases will be able to perform tasks too difficult or dangerous for humans.

On NASA's Space Shuttle, the Remote Manipulator System (RMS), built by Canada, has been used to deploy and retrieve payloads, examine the tiles covering the Orbiter, monitor propellant burns, and even knock off ice, all under the control of crew members on the aft flight deck. Similar to the Mobile Servicing Center (MSC) illustrated on the facing page, the RMS arm is 50 feet long, with six joints, corresponding somewhat to the human shoulder, elbow, and wrist. Its special end effectors, similar in function to hands, can grapple a payload or satellite weighing up to 65,000 pounds, hold it rigid, and release it. TV cameras mounted at the elbow and wrist provide the operators with a close-up view of what the arm is doing. Since the system lacks autonomous operational capabilities, it is controlled from a workstation inside the Shuttle - an intravehicular activity (IVA) rather than extravehicular activity (EVA).

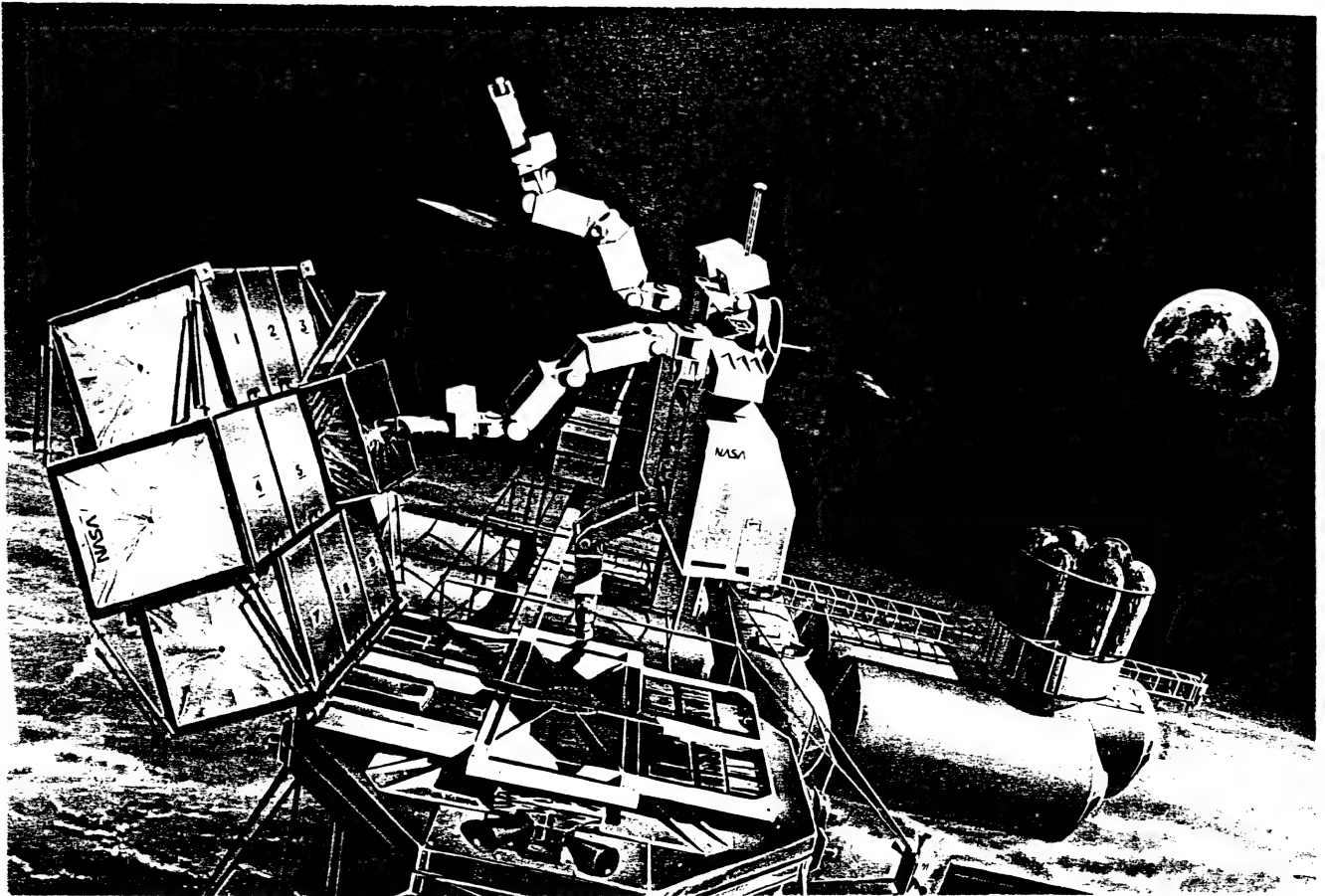
The MSC, a more sophisticated RMS, is being devel-

oped for Space Station *Freedom* by NASA and Canada. It will provide a platform for Station assembly, or satellite servicing outside the Orbiter's payload bay. Its 55-foot remote manipulator arm will be similar to that of the RMS, with an additional direction of movement at its shoulder. According to Edith Taylor of Johnson Space Center (JSC), "The Space Station RMS will be able to berth the Orbiter (about 280,000 pounds), avoid collisions, and do fine, dextrous tasks that we can't do with the Shuttle RMS."

Tin Man to Complement MSC

To operate in conjunction with the MSC, a more autonomous teleoperated system, the Flight Telerobotic Servicer (FTS), is being built by Martin Marietta Co. of Denver, under a contract to NASA. Dubbed the Tin Man, it is slightly anthropomorphic, like a person with nothing below the waist except a "leg." The design includes a pair of camera eyes and two manipulator arms with end effectors which connect to tools.

The FTS system will include two workstations, one on the Orbiter and the other on Space Station. It will operate from the Shuttle during assembly of *Freedom*, and then be attached to a transporter or to a fixed base. At this point, it can be used for either dependent operations (electrical power, data transfer, and video connections through an umbilical to the Station), or independent operation on its two-hour supply of battery power. Eventually it could ride piggy-back on an Orbital Maneu-



NASA artist's representation of Tin Man

vering Vehicle for remote operations.

"The emphasis has been on developing a system with a wide variety of servicing operations for maximum flexibility," says James Lowrie of Martin Marietta. "We've demonstrated the ability to perform the tasks in a laboratory environment. What remains is to demonstrate we can perform those tasks in a zero-gee environment."

By automating as much work as possible, extravehicular time for astronauts will be reduced significantly. "The FTS is not an experiment," says Charles Fuechsel, Project Manager of FTS for Goddard Space Flight Center (SFC). "The object is to get work done, not find out if it can be done."

To accomplish the same tasks as a crewman, the telerobot must have size, reach, and dexterity similar to humans. "Decomposition of a task step by step give requirements for grappling and other features," says Fuechsel. "Computer-aided design, graphics, and kinematic steps produce a realtime cartoon that convinces us a machine built to these specifications will be able to carry out the Space Station tasks."

In a simulated graphics movie, the Tin Man resembles a long-armed astronaut from the waist up, and it assembles trusses like a kid playing with Tinker Toys. Its five-foot-long arms have a total reach of 13-and-a-half feet. Each arm can move seven different ways, at shoulder, elbow, and wrist joint, but the leg has only five degrees of freedom. It can move itself up to 20 feet, from one work site to another, using the leg for position-

ing and support, and can also be mounted on the Station's remote manipulator arm, like a worker on a cherry picker.

The Tin Man carries extra tools, batteries, computers, controllers, and communications equipment. End effectors are attached to the manipulator arms, through which power, data, and video are transmitted. Interchangeable tools allow each end effector to perform a variety of tasks efficiently.

In addition to the camera eyes, each arm has a wrist camera so the controller can see what the end effectors are doing. The manipulators can apply 20 pounds of tip force, but the controller receives no sense of touch from the robot, and must depend on data feedback to determine the amount of force to apply. A fail-safe brake is included for override control, and a manual brake release allows an EVA astronaut or another manipulator to move an unpowered joint. Redundant safety receivers enable an astronaut to disable the telerobot from a safe distance, in case of trouble. Repairs can be made by an EVA crewman with modular replacement parts.

The control system will provide growth to full autonomy with preprogrammed tool fetching and holstering, learning and play-back of motion scripts, interpreting hand controller signals, and converting them into motion. A voice command headset will allow control operation. Caution and warning lights and multiple video displays, both keyboard and voice input, plus a tone generation system for emergency warning will furnish flexibility and redundancy of control to the *Freedom*

workstation.

Future growth of the telerobotic system will further reduce extravehicular crew involvement. Greater automation, increased efficiency, and ground-based teleoperations will make it more independent. Planned upgrades include stereo cameras in the "eyes," a better camera positioning boom, improved manipulator (arm) and stabilizer (leg) control, and automated sequences of motion. Battery kits will extend independent operations to eight hours, with thermal control and radiators to remove excess heat.

A second growth package will aim at full automation of servicing tasks, with addition of a laser scanner and artificial intelligence for image processing. "If you are combining autonomous control with teleoperations," explains Jeff Becker of Martin Marietta, "you normally have to have the human operator understand what the machine is doing, but to some extent you [also] have to have the machine understand what the human operator is doing with the teleoperations."

Shuttle flights, perhaps starting as early as 1994, will test the telerobot's manipulator performance, its dextrous servicing system, and the human/machine interface. However, budget constraints have already resulted in cancellation of the Orbital Maneuvering Vehicle, and the FTS and other Space Station *Freedom* robot designs may be changed or their development even dropped, due to recent reviews prompted by critics of the program. None of the robots described in this article have been cancelled at this point in time, however.

Fisher-Price and Augustine Reports

In response to charges of excess EVA time required for *Freedom's* crew members, the Fisher-Price report was released in July 1990 by the External Maintenance Task Team Management Review. Chaired by astronaut William Fisher and JSC robotic systems branch chief Charles R. Price, it concluded that "post [assembly completion] maintenance of *Freedom*, maintenance is manageable through EVA and robotics given the adoption of certain recommendations [of this team.]" Their study covered all five Space Station *Freedom* robots: the Mobile Transporter and FTS (built by the US), Space Station RMS and special purpose dextrous manipulator (from Canada), and Long Arm/Small Fine Arm (from Japan). In addition to establishing design standards to make maintenance operations robots compatible, the report recommends that the robots be able to be operated by ground-based controllers, thus freeing astronauts from time-consuming maintenance tasks.

Another report, released in December 1990, by the advisory Committee on the Future of the US Space Program, chaired by Norm Augustine, CEO of Martin Marietta, is more critical of NASA planning. This review recommends redesigning *Freedom* for simplification and cost reduction. The Augustine report also urges concentration on "primary life sciences and microgravity experimentation." Though it does not advocate abandoning robotics, implementation of its recommendations would clearly require delays in *Freedom's* completion, with postponement or cancellation of any program

deemed non-essential or too expensive. NASA administrator Richard Truly promised further Agency study of the report.

Rescues in Space

The most ambitious and anthropomorphic robot so far, a semi-autonomous, intelligent free-flyer which operates by voice control, is being developed in JSC's Engineering Directorate. Called the EVA Retriever, it is about the shape and size of a person with the legs cut off. It fits into an astronaut-type propulsive module, the Manned Maneuvering Unit (MMU), for controlled extravehicular flight.

Clifford W. Hess, project engineer for the Retriever, explains, "In the EVA world, there's a real application for a robotic-type device for the retrieval function. Every time we did EVA from Gemini on, we've lost or almost lost hardware in orbit. So, based on experience, you're going to lose tools on Space Station, because you've got more people going out more often [and] doing lots of work. Hopefully it won't happen, but a crewman might become untethered and start drifting off [because] his hardware fails or he forgets to hook up to something with his tether. Assuming what is lost is valuable, critical to the mission, or is a crewman, you can, by voice, command the Retriever to activate.

"[The Retriever] is on standby, all checked out, and is ready to go in a very short time. You've got to get the crewman fairly quick because he's got consumables [oxygen, batteries, and water] that can only last so long. And the longer you wait, the harder it is to get him. You have to have more propulsion and go farther, since as the crewman starts drifting, he gets farther away faster because of the orbital mechanics."

The Retriever will be easier to maneuver closer in to the Station than the Shuttle would be. "Your best chance to get [the crewman] is early in the time frame, with the Retriever," Hess explains. "Pretty soon you have to have something like the Shuttle to go way out there." The robot, unlike the Shuttle, will always be prepared and available in its hangar.

"If an astronaut were to drift away, we'd definitely go and get him," says Reuter. "We'd still try even if the robot might not have enough propellant to retrieve him and return.

"I think you'd take the chance, if there's any way at all to get the human with the robotic system," adds Hess. "You can take a lot more risk with it. You might lose [the multi-million dollar system], but that's just money, not lives. If you had to send a man out after the person you lost, you might risk losing the second crewman."

When the Retriever reaches the crew member, "I think the most secure grip is to grab him in a bear hug," Hess says. "We've put some tactile sensors on the forearms and chest for whole arm grasping, so [the robot] can tell when it's coming into contact with him and won't squeeze too hard.

"For things that aren't crewmen, [retrieval] will have to be decided real-time," he continues. "If it's a [lost] tool, you have to start making some trade-offs with your robotic system. Is [the tool] high-cost, critical to the mis-

sion? Or is it something that has a lot of mass and could be a danger when it comes back? It might bump into the Station and damage valuable equipment or hit a crewman" on a later orbit. Also, retrieving equipment could save valuable time, since Shuttles will only bring new supplies up every 90 days.

The Retriever is voice-activated from the radio communications loop, so the robot can be directed by spacewalking astronauts, crew members inside Space Station, or controllers on the ground. "We call [that] supervised autonomy," Hess says. "[The robot] may make some recommendations, after it's activated, based on what it knows - how far the object it's chasing is and how much fuel it's using. But the human supervisor would make the real judgment calls.

"Our goal is to try to get some smart robots working with the EVA crewmen. The EVA Retriever is the first step. It's a very structured role, and you know what you have to do - going out, retrieving something and coming back. Later you can get more into the helper mode, [something] like a plumber's helper or a nurse to a surgeon, handing him tools.

"A teleoperated system where you run the robot from inside the Station ties up a human operator," he explains. "So it really isn't giving you productivity in all cases. But the problem with a highly autonomous robot is that you have to understand the task well in advance, so you can automate it. Teleoperation can accommodate a lot of tasks where you don't know things ahead of time, because the human's more in the loop. The tele-robotic system designed to maintain and repair the Station doesn't require an EVA crewman."

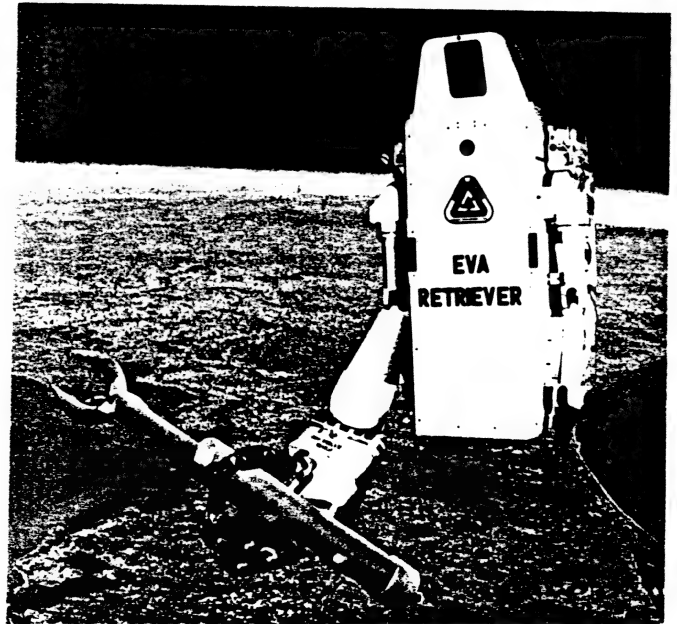
The JSC team decided on an autonomous, smart hand for the robot, instead of a series of interchangeable end effectors. "A dextrous hand can use existing tools and handholds that the crewmen use," explains engineer Larry C. Li.

The Retriever was demonstrated at the JSC Engineering Expo in November 1990. Its autonomous, smart right hand is powered by seven drive motors, the hand has six possible motions or degrees of freedom for greater dexterity. "We need a hand and arm system that can grab [objects of] various shapes and sizes, without knowing ahead of time what they are," says Hess.

With its touch and pressure sensors, the two fingers and thumb of the robot hand will actually be capable of greater sensitivity than a human hand. The sensors judge where an object is before touching it by bouncing infrared light beams off the target. The return signals enable the three robotic fingers to curl around an object before grabbing it. This eliminates the risk of bumping the target and knocking it further away, since in zero gravity, objects tend to rebound like rubber balls.

The left hand, developed in-house at JSC, is a three-fingered, non-anthropomorphic model that traps its target as it closes. Its three motors furnish three degrees of freedom for the fingers. "A dextrous hand that's not anthropomorphic can still have the ability to adapt to human interfaces," says Li.

The robot's head has been placed on a turntable device for rotation. The vision system now includes a



Artist's representation of EVA Retriever

three video camera array, one to look straight ahead and one at each side for peripheral vision or electronically scanning an area. Computer capacity has been upgraded by installing over two dozen 32-bit parallel processors. "To design a system like the human eye-brain coordination is not yet possible," says Don E. Rhoads, tracking systems engineer. "We're in the infant stage of developing vision systems that can recognize objects."

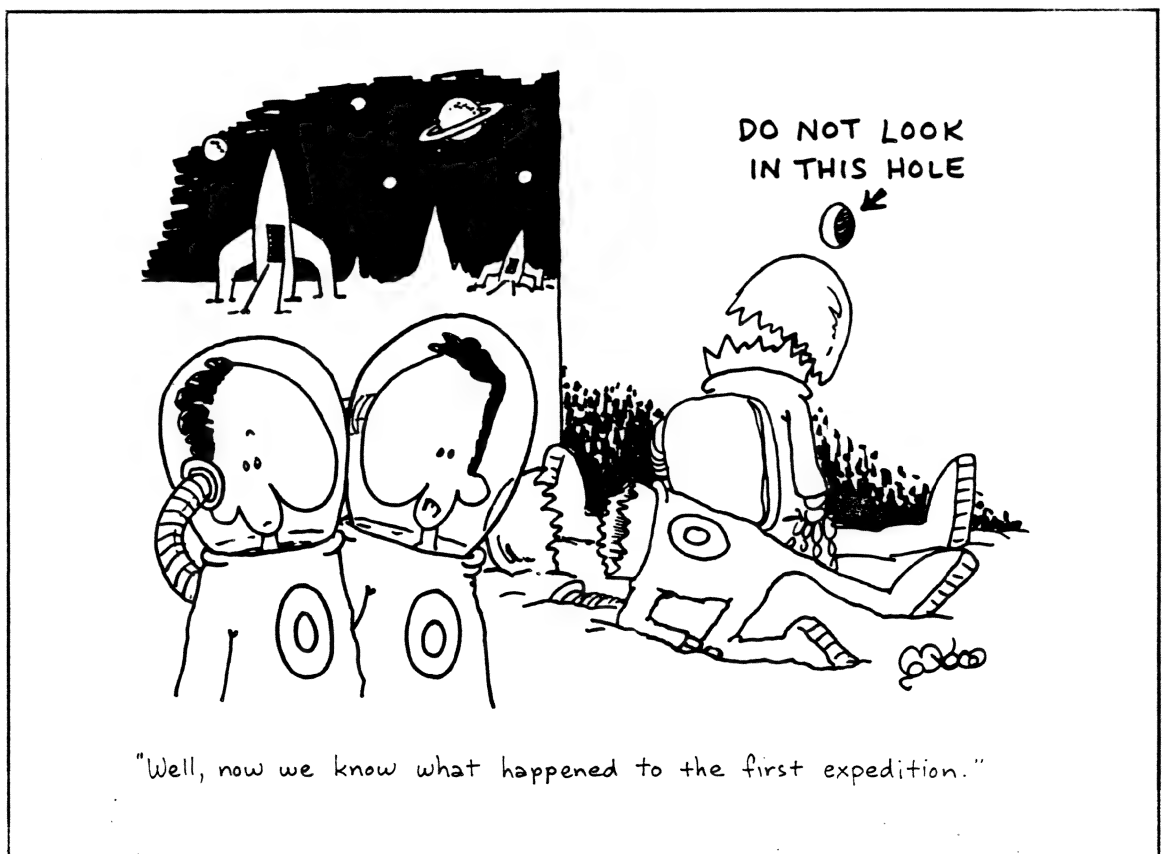
Reuter estimates the total cost for an on-orbit operational robot as "in the \$90 million to \$100 million range." He is proposing a flight experiment on the Shuttle with an improved Retriever adapted for space. To demonstrate its rescue ability, the robot might rendezvous with an astronaut in a maneuvering unit.

"It's tough to build a robot that's as smart as a human right now, in that [human] size package," Hess says. "You come out with an anthropomorphic-type robot just because you're trying to do the same job a human does. It's natural evolution."

Future of Robotics in Space

Planetary exploration, such as Mars Rover and Sample Return missions, will require robotic systems with increased intelligence and autonomy because of uncertain terrain, wide ranging collection of samples, and communication delays. During the Mars mission, the robot rover's manipulators will collect samples, aid in recovery from accidents, and make minor repairs during the 300-day traverse of the Martian surface. Then the rover must trek back to the ascent vehicle and transfer the sample canister to it for rendezvous and docking with the orbiting spacecraft and the flight home to Earth.

Artificial intelligence, combined with teleoperations, will allow scientists on Earth to conduct experiments in space. Though robots will never replace astronauts in space, they will complement them, to our infinite gain.



126 West Hydrolift
Colony TB98950 Ex.9

Date: Zarday 43rd., 2193
Ref.# TX640977JN322

WORK ORDER

CENTRAL PEST CONTROL

"If it bugs you we squash it"

Dear Mr. Smith

We are in receipt of your telebeam regarding your possible Wirebug infestation in your Machine Room resulting in the loss of N/A employees and N/A merchandise and/or equipment.

Your pest control expert is Tal Ernsipiker, a specialist in the eradication of common industrial parasites ranging from simple asphalt eaters to the more hazardous feral mutations. Our expert exterminator Tal Ernsipiker will be happy to provide Central standard free estimate and carry out the deinfestation immediately or at your convenience.

In the event that our expert exterminator is injured, devoured or otherwise unable to complete the eradication a replacement will be provided at no extra charge.

Thank you for your patronage.

Nils Bradoc
Nils Bradoc

Service Dispatch Department
Central Pest Control

Tal-
Could you get over to Excon and
look out their problem? Some
body from there has been
up there and about it.
I hope you can help
it out. Thanks
Nils

Cellarman

by Kurt Hyatt

illustrated by Richard Tomasic

*Kurt Hyatt has been published in **Space and Time**. He is a naturalized citizen, originally from Toronto, Canada, who holds a B.A. degree in Creative Writing from the University of Kansas. He lives in Las Vegas, Nevada, and his non-writing hobbies include golf and jogging.*

*Richard Tomasic is a free-lance cartoonist, based in Los Angeles. He creates both single panel cartoons and strips; some of his strips first appeared in **L.A. Funnies**. He does a lot of miscellaneous gag cartoons these days, on both SF and mainstream subjects.*

There are all kinds of ways to earn a living, legal or otherwise, and no place with more scope to do it than Colony, a world of factories, mines and chemplants. But if you've spent the last ten years of your life dodging slice beams in the Android Rebellion or fought hand-to-hand with Cosax machine men in the swamps of Waterworld, it's pretty damn hard to settle down behind a desk all day keying datatapes and running to fat.

So I'm what everyone here calls a cellarman. I do nasty, permanent things to living creatures whose only crime is to interfere with the smooth operation of humanity's vast machine on this planet. Which I suppose in some philosophical way they have a right to do, since they were scuttling about the rocks and spinetrees long before we sank the first mine shaft or raised the first tri-steel factory. So they fight back and I fight them and that's how I earn a living.

When they sent me to Excon that morning, it looked like a routine call. I hadn't heard much about the place, except that they had a lot of labor problems and strikes before old man Forsyth took over and somehow got everything running smooth.

I stood in the waiting hall letting my armpits dry and enjoying the coolness after the desert sunbake outside. Someone had dropped a few checks on the furnishings. Plenty of speerwood and brasse. Should be able to

handle the bill if I found charworms eating the plastilation in the walls or zippos scampering from heat vents in the front office, scaring the panties off the secretaries.

"Good morning, sir, and welcome to Excon, the planet's leader in prefabricated chemsteel girders and industrial polysheet. Is there something I can help you with?" the receptionist greeted me. She was a nice little model IV, great legs encased in a tight blue dressuit and spun gold hair.

"Yeah, I'm from Central Pest Control. I have a work order for a Mr. Smith."

"Oh, yes, he's the company coordinator. Let me buzz him for you."

"Thanks."

It wasn't long before he stepped from the lift. Right away I recognized him despite the tailored exec suit which clashed badly with a dwarf body and a flushed, rotund face. Major Quann, in person.

The asteroid wars, back in '29. He was my commanding officer on Solitaire before he sold us out and went over to the Zeroids. All the months I spent in the Zeroid punishment camp, I fantasized of the day I would meet up with him in some appropriate place like the back of a spacebar or on some lonely walk ramp. I heard that after the war, he went underground, working for the Orod Smuggling Lords. So what was a dudu like Quann doing working for a legit company like Excon?

"You from Central? Good. I Mr. Smith," he announced, snatching the work order from my hand. Obviously, he didn't recognize me. "We have trouble in Machine Room techs tell me. Little gray things like so make comm and lights not work. Many in Machine Room."

"Sounds like you have wirebugs. Pretty routine industrial pest on Colony. They like to nest in the communication boxes and eat insulation from the optic lineals." This brought me back to the reality that I had a job to do, and business did come before pleasure.

"You can fix?"

"Not too much of a job. Where's the expansion point for the infestation?"

"Hah?"

"Where are the bugs coming from?"

"It on level B, under assembly plant. You follow wall readouts." He peered up at me with a kind of uneasy suspicion. "How long you be down there to fix?"

"Depending on the roosts, usually about two hours." I caught sight of that model IV receptionist smiling at me from behind her speakwrite.

"Two hours to finish. Good. If job take longer you talk plant manager level G."

"Will do, Mr....Smith."

"You check back me when done. Not forget."

"Right."

I lugged my toolbox to the lift past the still-smiling receptionist. Vox, that model IV did have nice legs.

I'll say this about Excon, their plant did stink. I got a whiff coming down the warehouse lift and it ripened to a tangible presence in the steam and bustle of the assembly floor.

I took the nosefilters from my belt, and working them up my nostrils, checked the place out. It was a great little operation. I watched the extruder load the lines creaking all around me, and the white uniformed cathaulers moving through the vapor from long celon dip tanks. Up in the murk of overhead scaffolding, I noticed all the induction fans had been shut off. That wouldn't help the stink problem, whatever it was.

I found the ramp and followed it down to the Machine Room. The smell got a lot worse, nipping at the eyes. It was quieter at this level, and darker too. Rows of vacuum wheels and pressure engines ranged out of sight in the gloom, broken by the yellow glow from wall bars. Lines and cables from the darkness above hung like creepers in a humid, throbbing jungle. There was a pattering of feet from under some machinery, then silence. Wirebugs? Maybe.

I slid my particle gun from its holster and checked the clip gauge. Then the meter on my lightstick. Both fully charged. I set the toolbox down by the railing and from inside clipped two packs of sonic lugs to my belt.

It was an old joke on Colony that the average cellarman hauled enough equipment to arm three Peacemakers. We had to. Colony was the industrial heart-planet of the system. We had carpeted every kilometer with weapons forges, neotextile plants, chem dumps, mines and fusion domes. All this exposure to chemicals and odd types of radiation over the centuries did a lot of funny things to the native plant and animal life.

They just sort of adapted to a new environment.

Like eels breeding in silos of waste oil. Slime blobs feasting on concrete walls. Termites crawling into engines and munching the alumide casings on speed bearings.

Sometimes they got big and nasty. Claws and suckers lunging from a pile of warehouse crates to drag some screaming belt mechanic back into the shadows for a bedtime snack. I remember the time we had a flock of hairy nightmares roosting up in the lofts of the Sandcrawler Fabrication Building. They'd swoop down on some poor girl soldering microbars, carry her high above the transport dock and dump her. Then they'd flutter down and suck up the spillage.

The lightstick beam wandered over the concrete floor. It was crisscrossed with the little splayfoot tracks of wirebugs. Plenty of them. I got to work placing boxtraps in likely places throughout the room. I could see flocks of them scurrying from the path of my lightstick. I placed the last of the traps and closed up my toolbox. By morning they'd all be lured inside by the scent and vaporized into nothingness.

A sign swam into the lightstick. PUMP ROOM. Below it was a steel trapdoor held in place by a large lockbar. That's funny, I thought, fingering the lock. Here was another level below the Machine Room and another possible source of wirebugs. Why didn't they have me check it out? Maybe they forgot to mention they had a pump room. Or maybe they didn't want me to check it out. Mr. Smith alias Major Quann.

I flicked the lightstick onto the lockbar and turned the frequency to red load. Steel began to boil under the beam, molten drops running down the hatch like ball bearings. I worked my fingers under the edge, and after some real sweating got it pried up and clanged back against its hinges. Immediately, a swarm of wirebugs fled from the shaft, gushed around my boots like dirty water and vanished into the Machine Room shadows.

The shaft leading to the pump room was as black as a drainslug's colon and made the stink in the assembly plant and Machine Room smell like a spring wind blowing over a field of syberines. It seemed to push through my nosefilter and water my eyes with the complexity of a fine wine - a symphony of odors ranging from vintage gomphdroppings, gangrenous blood and metacyline lacquer solvent.

This was something new. No plant I had ever squashed a wirebug or blasted a mine flapper in had smelled so bad. I eased out my particle gun and carefully climbed down the ladder until I was standing on the floorplates of the Pump Room.

The pump squatted like a huge spider among a litter of thick conduit reaching off out of sight. Under feeble blue lights I could make it out as an older model Phase Twenty Circulator. Pretty silent for an old girl, though: a nice regular sighing, like a sleeping ogre. I pulled my lightstick and shone it around. The beam ran over pipes and cables, random piles of equipment shrouded in dust. A couple of wirebugs skittered from the light and took refuge under a relay box.

Nothing. No sign of leakage that I could see and the stench was giving me the starwarp of all headaches. Where in Zerid was it coming from? Maybe from inside

the pump itself.

I clambered up the rails to the inspection cover and snapped the seals. It took some good muscling to swing it open, the shrieks from corroded hinges running up and down the walls, fading off into the distance. Just under the lid, the celon swirled like a silent black lake, sending back muted glints from the lightstick. A shroud of vapor dripped over the lip, causing the skin on my hands and face to tingle and my eyes to water in earnest. This was it. This was where the smell was coming from. I took a long careful breath through my nose-filter.

Something was polluting the celon in the pump, the lines and the big dip tanks in the assembly plant. They needed to get their chemical boys down here fast and take some samples -

There was a frantic splash and something exploded from the celon to grab me by the front of my vest. It looked like a huge black leech, its eyeless face a mass of spines and jerking antennae. I threw myself back from the lid, trying to shake it off but it had a deathgrip with these pincers. Thrashing madly, it was slowly dragging me through the hatchway. I clutched the lower railing against the silent immense strength of the thing. I knew I didn't dare free one of my hands for a grab at my particle gun.

There was a frothing of the liquid inside the pump chamber and I saw a horde of these leech things splashing around, trying to push their way past their shipmate and get those madly scissoring pincers into me. It was chow time for sure.

I managed to get my knee against the top railing and using this as a leverage, grabbed the hatch cover with my right hand and slammed the lid shut across it. That did it. It gave a squirm, took a snap at my face and fell back among its friends. Another second and I had the hatch closed and the locks snapped tight.

I steadied myself on the ladder and wiped a forearm across my face. Well, this was a whole new job, but not that much more expensive than a wirebug vaporization. All I had to do was get them to shut down the system, pump the celon through a filter into a holding tank where I could take care of those babies with a voltage grenade or equally nasty goody from my box of tricks. Time to see the plant manager and arrange it. No big case. Or so it seemed at the time.

Taking the tube to the upper office levels was like warping to another planet. Plenty of light and clean air, no noise or nosefilters. I walked in the door and into the bright smile of another model IV receptionist.

"Good morning, sir, and welcome to Excon, the planet's leader in prefabricated chemsteel girders and industrial polysheet," she said cheerfully. "Is there something I can help you with?"

"Sure you can. I'd like to see the plant manager." I had to say this about Excon; they certainly had good taste in andrexes. This one was a perky brunette squeezed into a pink bodysheath.

"You must mean Mr. Herzog. Say, aren't you the cellarman...excuse me, the pest control expert Mr. Jones called in?"

"You mean Mr. Smith, don't you?"

"Of course, how silly of me."

"Right. Now where can I find this Mr. Herzog?" I asked, checking out the big office. Then I noticed something. There weren't any people. All I could see was empty desks and chairs but with the readout screens lit and running.

"What happened, is everybody gone to an early lunch or something?"

"Oh no, we no longer use humans in our administration. All our departments: Sales, Billing, Records and all that. Everything has been put on automatic."

"How long ago did this happen?"

"My, let me think. Mr. Forsyth authorized the dismissals about a year ago."

"You're saying this whole show is being run by Forsyth and a roomful of machines?"

"Just what do you mean by that?" The bright smile abruptly became a pout.

"Well, it's sort of unusual..."

"I know what you mean. You think I'm just another piece of machinery around here, like a letter sealer or a compbank."

"Not exactly..."

"Let me tell you I may be constructed of chemsteel and protoflesh but I'm just as good as any human you're likely to see. And may I tell you, more woman than you've ever met, although I'm not about to prove it, because I'm sure you're not my type."

"Look, I didn't -"

"And I'm definitely not attracted to walking armories covered in dust and smeared with oil. So don't try asking me out. I don't care how big and blond you are or how cute you look when you roll your eyes and sigh with exasperation."

"I apologize! I sincerely take back anything I may have unknowingly said to offend you." Andrex in need of routine emotional circuit tuneup. I've seen this happen before when they get overworked. "Now might I humbly ask where Mr. Herzog is hiding?"

The pout sucked back a bit. "Room 110, just down the hall. You can't miss it."

"I thank you."

I wasn't ready for Herzog or his office. That curvy little andrex should have tipped me off. I was standing on apple-green carpet embroidered with a huge red set of lips and protruding tongue. The maniac jangling of an Etrusian sitar was coming from somewhere and the walls were littered with pop music holograms and incomprehensible murals. The place looked like a tech cadet dorm. I took a cautious sniff. The air was loaded with the sour, oily smell of dhung. But the plant supervisor was nowhere to be seen.

A fountain of smoke suddenly lifted from behind the desk. I leaned over to see a figure in a purple velvetex coverall sprawled on his back, teeth clenched around an ornamental dhungpipe.

"Ah...Mr. Herzog?"

A pair of muddy eyes flipped open and focused. He lurched up and steadying himself on the back of the chair, offered a limp hand.

"Hey hey hey. Come down and see go shipmate. It's tight all round and do glad from here to Syron Three. What do this earthbrother coming on lightdrive fine for you?"

"Yeah...I'm from Central Pest Control and I was called in to handle a wirebug infestation you were having in your Machine Room. Well, that was routine and easily treated. But there's another -"

"So come and go easy so and settle your tailsection chairtime while I stand my person down." He snickered and jabbed the stem of the pipe at me, nearly dinging me in the eye. "Like a crash, spacebrother? Good gross. Right off the jumpship didly on up Spiros path from the Sacred D. No twist my lip, harpsangel time." He slouched in his seat, dhungsmoke wrapping him in his own fogbank.

"The wirebugs aren't your only problem down level. You have some kind of mutant life form breeding in your pump reservoir," I explained carefully, wondering how much was getting past the dhung. "I'm no chem biologist but it seems to me that the mutant's body or body waste is reacting with the tank celon. That's where you get the smell."

Herzog seemed to be staring at a nonexistent object to my right. "Big topside earthbrother fanned coins on your easypath down to shoo wirebug earthbrothers to far slipschute phase nine. What your lids flutter in pump res no problemwise."

"Let me run that past you again. Your pump tank and probably the whole pipe system on level B is crammed with the nastiest little squorks you ever laid eyes on. And if you don't believe me, let's take a little trip downlevel and I'll let you stick your head in a certain hatch."

"Hey hey, spacebrother. Make go pass on your happy gland this pumproom readout. Maybe later we can zabo on bobb a true do on bad passing gas trouble down pump scene. Maybe later, spacebrother." He exhaled smoke at the ceiling and closed his eyes. "You just track your magsoles zippto to worldshine without and we kiss your payman company coming on strong from the lightship of smiles."

"Look, Herzog, I'm only going to need a couple of your techs -" But the plant manager was on his way back to the hideous carpet. He tilted sideways, and still grinning around his dhungpipe, vanished behind the blotter.

So this was the end of the job at Excon. Just turn in my sheet to billing and leave. After all, it was their problem. If they wanted to live with a stinkpool smell in their assembly plant and giant crawlers in their plumbing, why should I complain? If they got tired of it later I could always come back and fix things.

Yet in a corner of my mind came a little voice saying that everything was not as it seemed. That they knew about the leeches a long time before I came along and probably made the same conclusion about the smell. It was almost like they wanted them there. And why did Forsyth fire his administration, put everything on automatic, yet keep two zeroes like Herzog and Smith, alias Major Quann?

Quann. I had almost forgotten about our reunion. And it occurred to me what he was involved in had to smell worse than Excon's pump room. Now what could that be?

Another gout of smoke drifted from behind Herzog's desk to fan out over the ceiling. It was time for a second inspection of Excon property downlevel. And this

one was going to be on the house.

I found myself a little nest of empty drums near the assembly plant storage area and when I was sure no one was looking my way, ducked inside. The smell in the place was still there, strong as ever and it brought back the familiar headache.

For awhile I watched the coming and going of white uniforms moving through the steam. Flawlessly, the newly-made chemsteel girders slid from the injector chutes, dropped into the celon tanks when they were hooked out and sent along a conveyer track out of sight.

Very efficient. That's the impression I got of both the machinery and the workers. Nobody talked, nobody stretched or yawned or just goofed off for a moment. A buzzer went off and they all marched off as one, while the next shift marched in and got right to work. They reminded me of a crew of Astrone mining automatons, but without the good humor and camaraderie.

Then I saw it. I first took it for a dark rag draped over the side of a dip tank until it sprang up and sank its pincers into a passing worker. He stopped dead and let the leech just hang there, jerking. I had a pretty good idea of what it was up to. After a minute or so, it dropped with a wet plop to the floor, and using its spines, crawled to the tank, hauled itself up the side and slid from sight. The worker took a few unsteady steps, then went on to adjust some equipment as if nothing had happened.

"Hey! Hold it a second, shipmate!" I scrambled from my pile of drums and hurried over to the former a la carte special.

He paused with a screwdriver over an idler cam and peered at me, his goggles glinting in the overhead lights.

"Afternoon, spacer," he said. "I sure hope what you have to say to me won't take much time because we're three units behind a new production record."

"Don't worry about it," I consoled him. "Want to tell me why you let that leech thing help itself to a free meal off you? Did it feel good, or something?"

"What leech thing, shipmate?"

"Right. Let me take a look at your chest."

"As I was saying, a new production record -"

"What's your name, shipmate?"

"Elno Gruber. Employee CY9118, fifth shift."

"Well, Elno, I'm the new Corporation Executive Officer from the Department of Dispersing Nine Millimeter Set Screws. Now let me see your chest."

"Um...I suppose so." He reluctantly put away his tools and pulled the zipper on his uniform. "Getting back to what I was telling you, fifth shift is about to set a new production record this cycle for girders and if we do, we get to have our quota increased by two hundred units."

"That's wonderful, Elno." His chest was a mass of angry puncture wounds, old and new. "What about these marks here?"

"Of course, second shift has the lead in rail and rivet production. But we've volunteered an extra two cycles a shift and that'll beat them, just you wait."

"How long have you worked here, Elno?"

"Third shift is nowhere near us either. But don't get me wrong. They're a great bunch of shipmates and nat-

urally we're all in there pulling for the greatest company on Colony. Yeah."

"I'm sure glad to hear that. Say, let me take a look at those goggles of yours." His pupils were contracted to the size of diodes and he seemed to be staring through me to some production quota a kilometer away.

"Can I get back to work, spacer? Of course I'll have to deduct the time I've spent shooting the voids with you from my punch bar."

"Get to work, Elnor." He replaced his goggles and slouched off to be lost in the steam.

So this was why Excon stopped having their labor problems. A whole crew of drugged drones slaving away shift after shift for a few checks. Vox knows how long they expected to get away with this. But then again, I had to admit their production record was damn impressive. And what right did I have to be lounging around here while fifth shift lands that extra two hundred unit quota? I should be pitching in and helping them get an even higher one. Why in Zerid should I be left out of the greatest company on Colony working for the greatest bunch of shipmates?

Through a thousand meters of fog I found myself on my hands and knees on the concrete floor babbling about girder quotas and company loyalty. A numbness was creeping through me, like a subzero cold freezing my arms and legs, sliding my brain into an eternal wintery sleep. Like a sleepwalker, I fumbled in my vest for my emergency oxyrespirator.

There was a splash, followed by a dull wet thud from the celon tank behind me. Even in my fogged state, I had a real good idea what it was. I fell over on my side and grabbed the butt of my particle gun.

The eyeless face reared over me, liquid dripping down the black shapeless body. It paused as if licking its chops, pincers slowly opening and closing.

The red needle of my particle gun hit it dead square, scattering juices, spines and body parts like the insides of a dropped fruit. I lowered the gun to the floor. A thousand years later I pulled my oxyrespirator loose and strapped it on, ignoring a maniac voice in my mind chattering about quotas, the great guys in the front office and the need to get my lazy buttocks to work. For awhile I enjoyed my own private light show, then gradually, my brain began to clear.

I was amazed how only one kick smashed the door from its hinges and tossed pieces over the thick rug. I'll say this for Forsyth, he didn't bat an eyelash when I came strolling in.

"Good afternoon, Mr. Forsyth, I'm from Central Pest Control. I'd like a few words with you if you could spare the time."

"I don't believe I have you on my appointment read-outs," he replied casually.

"Gee, I must have forgotten to make one."

"Then I suppose all I can say is you'll have to come back at a later time."

I placed my knuckles on his hand-tooled sithide blotter and stuck my face into his.

"I'll leave when I've had my say, Forsyth. I've just come from that chamber of horrors you've got going down there in your assembly plant. You know, I once

visited the Penal Colony on Solitaire and saw their punishment pits. But that looks like staff R and R compared to Excon."

"I think you had better explain yourself and do it fast. I'm not sitting here making doodles on my viscreen, you know."

"Fine. Let's talk about several hundred of your workers drugged by some gas given off by the pump system. I'll bet they work cheaper and better than the latest industrial andrex. They don't worry about pain or fatigue and cheerfully log the long hours and ever-increasing quotas you set. Let's talk about the mutant leeches in the tanks dining on their blood. And don't tell me you and Herzog didn't know exactly what was going on for how long, Forsyth - months? Years?"

He leaned back on his chair and eyed me with good humor mingled with a fair amount of contempt.

"Now let me tell you what you really saw, Mr. Ernspeker. You saw members of the Excon team, the most hardworking, loyal employees in any factory on the planet. I provide comfortable quarters, simple yet nourishing food, clothes and job security for all. Isn't that what you saw?" He jabbed his pen into my vest. "And as to the supposed...ah, mutant leech attacks, well, I'm sure my people would have complained by now if that was happening. Don't you think?"

"Let me tell you what is going to happen, Forsyth." I grabbed him by the front of his jacket and jerked him from his seat. "When I walk out of here I'm jetting right to the Colony's Labor Commissioner and turn your fat posterior in. And when they hear about this little operation you'll be lucky to get off with twenty cycles in the agony chamber."

I felt something shoved into the back of my head. I looked around to see Quann pointing a blaster at my face.

"Me take him to the Green Room now, Mr. Forsyth? Me fix so no one know where he go."

"That won't be necessary, Mr. Smith." Forsyth settled comfortably back into his chair and gave out a patient sigh. "That's not going to happen, you know."

"Tell me how you're so sure."

"Because one of the biggest investors in Excon is Colony's Labor Commissioner. In fact, a lot of people have investments here. They can see us as a growing and profitable concern and are not likely to react to a torrent of wild accusations from some warhappy cellar-man."

"But you rush on down there, young man. I'm sure they'll have all the proper complaint forms for you to fill out and get on the Commission wait sheet. But I don't think we'll be seeing each other again."

"Me take him Green Room now, Mr. Forsyth? Me fix him good, no be trouble us," Quann pleaded.

"Not necessary, Mr. Jones. Just escort him from company property."

"You mean Mr. Smith," I said.

"You have a very quick mind and great powers of observation, young man. You wouldn't believe how hard it is to find intelligent, competent people in business nowadays. I have to settle for chaff, I tell you, chaff. It's such a pity a man like you has to be so sentimentally attached to humanity and so unrealistic towards the excel-

lent system I have operating here at Excon."

"I've heard they had a system a lot like yours on Old Earth. It was called slavery."

Forsyth studied me bleakly. "I almost forgot. I'll be deducting the cost of my office door when your company bills me. Take him away."

Then Quann finally got around to doing what he should have at first - relieving me of my weapons. He grabbed the butt of my particle gun and let off an agonized squall as he hit the deck on the other side of the room, his snub gun flying in the opposite direction. I had my lightstick out in a snap and flicked it to red load as I drew on them both.

"Like my little electron grenade booby-trap, Smith? Or wasn't I showing proper respect to my former commander?"

Quann stopped rocking back and forth on his knees with his injured hand tucked under an armpit to stare at me. Slowly the color drained from his face.

"What you mean?" he whispered.

"My, how the years have affected your memory, Quann. Like a few hints? Solitaire? The men and women you sold out to the Zeroids?"

Quann's eyes were fixed on the business end of the lightstick. He looked like he had just been disemboweled and someone was about to step on his colon.

"Nothing to say, huh?" I glanced at my belt timebar. "That's too bad because I've a few cycles to kill."

Forsyth's scowl darkened to an ugly slit. "You're up to something, Ernspeaker. I'm too shrewd a businessman not to see this little scenario in my office is just a farce you're playing out for some reason."

I leaned again the wall and made Quann a little sicker by carelessly tapping the lightstick's button. "Actually, I'm just pondering on what nine months in a Zeroid punishment camp is worth to Mr. Smith here."

"You're stalling for time. Why are you stalling for time, Ernspeaker?"

"Well, if you must know, while I was lying on your machine room floor recovering from the celon tank gas, I was thinking...what would I do if I was one of your loyal employees cum slave and came to my right mind, realizing what you and your happy crew had been up to. And I did notice that one of the side effects of the gas is a maniacal rage. Interesting, eh?"

"I've had just about enough of you and your arrogant self-righteousness, cellarman," Forsyth interrupted. "Since you're so interested in penal colonies, I'm going to promise you a renewed acquaintance of at least -"

There was a wild babble of voices in the hallway outside, growing in volume and bellicosity. There were angry yells and the crash of doors being broken down and furniture depreciated. A mob of workers in white jumpsuits burst into the front office and swarmed up to Forsyth's doorway.

It was the crew from the Machine Room and it didn't appear as if they were here to humbly ask for a slight increase in pay. Forsyth blanched and an ominous silence fell.

Shakily, Forsyth got up from behind his desk.

"What's happening?" he asked in a quavering voice.

"What is the meaning of this?"

"I was just about to let you in on a little secret," I said,

smugly enjoying the moment. "Before I came up for our cordial chat, I turned on all the induction fans in the plant. The Machine Room must be packed with the freshest air you can find on Colony."

A worker elbowed his way to the front of the crowd and jabbed his finger like a snub gun at the Excon president.

"There he is, shipmates!" he announced. "High pay, bonuses and paid vacations to the Radnor Pleasure Asteroid he promised us. And what did we get? Long hours, slops for food and I for one ain't seen a paycard since I been here!"

"Elno! How is the production quota coming along?" I asked. "Is second shift still the leader in rail and rivet production?"

"Prong the production quota and the rails and rivets. Prong us all for not figuring out what was happening to us all this time." His voice rose to a screech. "Down to the shop with them, shipmates! Let's give them a taste of their own wardrations!"

The room shook to a roar from fifty voices. The crowd surged forward, submerging Forsyth and Quann in a wave of bodies, fists and flailing wrenches.

Screaming and struggling, they were dragged through the front office and down the corridor to the lifts. Gradually the noise died away in the distance, leaving me to select a choice New Chicago cigar from Forsyth's humidor and settle myself comfortably into the recently vacated chair.

"The workers! They've assaulted Mr. Smith and Mr. Herzog and even Mr. Forsyth and taken them to the Machine Room!" The perky andx receptionist rushed into the office, her eyes wild and bewildered. "They... they've thrown them into the celon tanks."

"So?" I exhaled smoke at the ceiling and propped my boots up on the hand-tooled blotter. I had finally found something I liked about Forsyth - his brand of cigars.

"But the tanks were full of these squiggly black things and they haven't come up yet!"

"Somehow I don't think they will. But that's nothing for you to worry about; the Peacemen will be here sooner or later to sort it out. All it means to you is you're out of a job."

"Yes, but...What is going to happen now?"

"By a happy coincidence, Central Pest Control has an opening for a receptionist in their Personnel Department. I can put in a good word for you if you're interested."

"Um...I suppose under the circumstances that might be something to think about," she replied hesitantly.

"Great. Are you any good at speakbar dictation?"

For a moment she stood gazing at me, then a smile spread out from the corners of her mouth. Languorously, she eased her rounded bottom onto the edge of the late Mr. Forsyth's desk.

"Blondie," she purred, "I'm good at *everything*."

I've never been in the habit of calling a lady a liar, even a magnificently proportioned reproduction of synthe-steel and protoflesh. I got up and offered her my arm.

"Let's discuss the details of your new employment in the more convivial surroundings of a cozy bistro I know of."

Additional Reading

Trillion Year Spree: The History of ScienceFiction by Brian Aldiss. New York: Atheneum, 1986. (No longer in print in hardcover, but currently available in paperback from Avon Books)

Interested in the history of robot stories? Or the ways in which actual space exploration has influenced science fiction writers? You'll probably find the answer in Brian Aldiss' *Trillion Year Spree* (an update of *Billion Year Spree*, which originally appeared in 1973).

Unlike some other "studies of science fiction" I've read, the book doesn't try to trivialize the genre. In his discussion of its history, Aldiss is quite scholarly. For example, Part I, "Out of the Gothic," examines in detail the forefathers of science fiction. Although he considers Mary Shelley's *Frankenstein* to be the first novel that can truly be defined as science fiction, he also discusses earlier novels that brush the edges of the genre. From *Frankenstein*, he progresses onward to Poe, H.G. Wells, Edgar Rice Burroughs, and the advent of the science fiction magazine.

Part II, "Into the Big Time" examines science fiction from the 1950s on. Here Aldiss looks at those authors who laid the foundations for today's science fiction, and those who are still writing. He also examines two phenomena which have popularized science fiction - movies and cons. The final chapter, "The Future Now," looks at what science fiction might become.

Trillion Year Spree is not a lightweight look at science fiction. It is serious literary criticism, and as such, probably belongs on the reference bookshelf of any science fiction reader. (A word to the wise: don't try to get a copy through interlibrary loan as I did - it's impossible to digest the 500+ pages in two weeks' time!)

Robots: Machines in Man's Image by Isaac Asimov and Karen A. Frenckel. New York: Harmony Books, 1985, and *Reinventing Man: The Robot Becomes Reality* by Igor Aleksander and Piers Burnett. New York: Holt, Rinehart and Winston, 1983.

Though neither *Robots* nor *Reinventing Man* are recent publications, they do present a clear overview of the history of robotics, and of robotic technology of the 1970s and early 1980s. *Reinventing Man's* text, while written for the layperson, looks at the technical aspects of robots moreso than does *Robots*, and is illustrated with numerous figures and diagrams. *Robots* is illustrated primarily with photos, and Asimov devotes more time to discussion of "entertainment" and "teaching" robots. As the best-known creator of fictional robots, he also of course discusses the role of robots in science fiction.

Life and Times in Ripley, Ohio

Life has moved on in the last several months! You may have noticed a new Disruption Creator listed on our masthead - Dora June was born in August 1990.

It's easy to forget what havoc one small person can create, after having become accustomed to the relative calm of a six-year old! Try typing one-handed while holding a sleeping baby on your lap - one who wakes to scream if you even contemplate putting her in her crib for a nap. . Try to compose an editorial while being assaulted by those screams; if some of my remarks don't make much sense, you'll know the reason why. Or worse yet, try holding a very much awake baby who thinks that the computer keyboard and mouse are toys exclusively for her amusement. The result is a lot of typos and very little intelligible writing.

It's hard to describe the essence of being a parent - the frustration, the tears, laughter and joy. The closest another parent can get is to say, "I know what you mean. (I've been there.)" Non-parents must simply shake their heads in bewilderment (while possibly thinking, "How tacky can you get?")

Response to our first issue has definitely been good. Comments have been both negative and positive, and positive, and have provided us with lots of food for thought.

For example, we learned that the overwhelming majority of you didn't find our cartoons very humorous. You'd gladly sacrifice the cartoons for another story. Perhaps we've been reading *The New Yorker* too long; maybe this means we need a couple cartoon editors. (Volunteers, anyone?)

Possibly there's a cartoon generation gap - the "Star Trek" inspired cartoons, featuring the frustrated little alien, appealed more to survey respondents who were over 30. Nevertheless, we're prepared to try again. Let us know what you think.

Most of you liked our "read at one sitting" concept. Several of you did express disappointment both in the scarcity of stories and the price - you felt that you could get more stories for the same amount of money in other publications. This is certainly a legitimate complaint, but if we went for many more stories, we'd be destroying the very notion behind the magazine.

You will doubtless have noticed, however, that small

press publications are, by and large, more expensive than their "pro" counterparts. This is because, odd as it may sound, it costs the small press folk more to produce their zines, simply because they have less capital. The old adage "buy in bulk" doesn't work if they don't have the money to do so. So, they buy less, but pay more. If they're to break even, at the very least, they must set the cover price of their zines accordingly.

Everybody has their own expenses, and the way they meet them is by charging their customers for their services. For example, it costs a printer money to prepare his equipment for a job. That cost is included in the price he quotes us to print a *Hobson's*. The cost of producing the first few hundred copies will be quite high, comparatively speaking, because those set-up costs will be figured in. If the price per copy is to come into a reasonable range for us, he needs to print quite a few copies, probably 500 or more.

So what to do? Photocopying actually costs about the same, perhaps less if we do most of the work ourselves. But we're competing with photo-offset publications, some of which are probably printed on slick, coated paper (which we can't afford). Will the photocopied result look as professional?

Then there's anachronistic mimeograph. This is doubtless the least expensive route of all. But would it be accepted in these days of laser printers, photo-offset, and photocopying?

What a dilemma! For the moment, we've chosen photocopying, although we've had to accept tradeoffs here, such as a side-stapled zine instead of a saddle-stitched

one.

This ends my impromptu economics lesson (aren't you glad!). However, if you're interested in "seat of your pants publishing" you may enjoy reading Clifford Burke's *Printing It*. This book, although it was published in the 1970s, (before the days of desktop publishing) is still a very good guide for the impoverished publisher.

Back to your comments once more. True to form, our "Hobson's Choice" wasn't everybody's choice. Those who aren't Bradbury fans didn't enjoy "The Crazy Loves of Ray Bradbury" (though you praised the piece as a well-written article). If you aren't a fantasy fan, chances are you were lukewarm about "Who Walks By Moonlight." At least one of you felt that "Who Walks by Moonlight" had an overworked theme. Others said they learned nothing new about Bradbury, as they'd read the same information elsewhere.

Some of you felt that "science fiction and technology" was a misnomer, and suggested science fiction and fantasy instead. May you have found this issue more true to our name. There will be more nonfiction of this nature in upcoming issues.

All your comments have been helpful and have given us the courage to continue with this adventure. Please keep on letting us know what you think, both of our selections, and our way of presenting them. Your opinions are very important to us, and we promise always to take them into account. Write us at P.O. Box 98, Ripley, OH 45167-0098 or call us between 9:00 a.m. and 7:00 p.m. EST at (513) 392-4549.

Hobson's Choice

Science fiction and technology

Starwind Press

P.O. Box 98

Ripley, OH 45167-0098

Dead Men's Letters

A comment zine about things written by people who probably are no longer who they were when they wrote them, from Guy Consolmagno, SJ, residing at 1331 W. Albion, Chicago, IL 60636

Rod: As one unpublished writer to another, you have my sympathies. In my lifetime (I must keep reminding myself) I have published two dozen scientific papers, one popular book, there's a textbook on the way (Prentice Hall has signed a contract with Martha Schaefer and me for *Worlds Apart: A Textbook of the Solar System*, delivery due in December—hurrah!) but I have yet to publish a single work of fiction of any length in any format on any topic, except for fanzines where I was the editor! Perhaps this is nature's way of telling me something. The most recent rejection letter I got, from an agent, said "we do not have the necessary enthusiasm for the book to feel we would be able to market it successfully," which is another way of saying it's so bad they'd be embarrassed to be associated with it! I have to suspect that, maybe, they're right. So why do I keep writing? Because it's fun...

About my comments about fans... the most telling response I got, when telling this story (in Barry's living room, as I recall) was someone describing a survey of fans at a convention: an overwhelming majority said that they come to cons to meet their friends, but that they felt most of the other people at the cons were really weird and that they wish they didn't come...

Joachim: Hope you like Birmingham. I grew up there, on 15 Mile and Cranbrook, an easy bicycle ride from the Cranbrook Science Museum. I have fond memories of the museum, but rather mixed memories of Birmingham. (It was too white and too affluent for the 60's.)

Recent books worth noting, huh? If I listed them, you'd realize that I was a student (hence, *The Critique of Pure Reason* and *Being and Time*) with a fondness for dreadful mysteries (hence, *Dead Men's Letters*, by Erle Stanley Gardner). The only SF I've read recently is the most recent Stasheff novel, which is a long exegesis of Roman Catholic theology (fine, I guess, if you go for that stuff... except that I am doing that in school right now) and Kim Stanley Robinson's *The Gold Coast*, which was

pretty good. The latter I picked up partly as an excuse to go visit Alice Bentley's SF store, partly because I have volunteered (foolish me!) to sit on various panels at Capricorn in three weeks, and so I thought it might be politic to read something by the GoH, who will be panelling with me. What I am most looking forward to, at this convention, is getting to meet P. C. Hodgell, the author of *God Stalk*, one of my all time favorite books. The book, and she, have attracted a cult following because of the intense imagery, fascinating world, deep philosophical implications, etc. etc. I liked it because the main character reminded me of a girl I once dated!

Susannah: Congrats on getting Hobson's out for more than one issue. I did appreciate the freebie you sent of issue one (even though I was a slug and didn't send a LoC at the time, and I am curious about the life and trials of a desktop-magazine publisher. I also enjoy your tidbits of life-with-rugrats, something that (obviously) is outside my immediate experience. I did spend Christmas with my friends Dan and Léo and their two kids, Sarah (8) and Ben (6), who are a delight. Unfortunately, perhaps from being in proximity to kids, I spent most of the vacation in bed with the flu!

Religious discussions with people who already have decided they have all the answers can tend to get very frustrating. When they are family members, it's time to duck!

About Jesuit philosophy... well, let's see. There are several characteristics of Jesuit spirituality. One is the ideal of living "in the world, but not of it", which has certain connections with Zen but some important differences, too. Unlike most Buddhism or many fundamentalist groups, Jesuits are very "world-affirming"—the universe is God's creation, and good, something to be embraced and enjoyed. We aren't hermits who "reject the world" to live in a desert. We don't fall into the "spiritual, good; material, bad" syndrome. This has interesting implications for the Jesuit/scientist (like Teilhard de Chardin).

Gabe and Audrey: Interesting comments about Cliff's book. It has certainly not been an unblemished experience for Cliff. For instance, it is a love story with a happy ending, except that even before the book hit the stands the marriage was in big trouble (and has since ended). For another, he now finds that any computer he is known to use becomes a target for people who want to "show him up." Makes him a real popular employee, as you can guess. Finally, it is tough being a public person. He always referred to the "Cliff character" while he was writing the book, since it was clear that the real Cliff was never to be confused with the character in the book... but it ain't easy.

Steve: Welcome. I now know infinitely more about steel drums than I used to!

Galileo as Scientist: Myth and Reality

Guy Consolmagno SJ

Wed, Dec 18, 1991

I. Introduction: The Myth of Galileo the Scientist

A popular image of Galileo as a scientist is that he represented a sharp break from tradition; that he stood alone against a hostile world of medieval science mired in Aristotelianism; and that his invention and use of the scientific method revolutionized western thought. For instance, Stillman Drake has written, "The truly influential and pervasive aspects of modern science are not its facts at all, but rather its method of inquiry and its criterion of truth. ...those are precisely the things whose introduction created modern science. They were...first made clear in the writings of Galileo..."¹ And in his foreword to the *Dialog Concerning the Two Chief World Systems*, Albert Einstein refers to "the paralysis of mind brought about by the rigid authoritarian tradition of the Dark Ages"² which was broken by Galileo, and a "naïve picture of the earth as a flat disc, combined with obscure ideas about star-filled space and the motions of the celestial bodies, prevalent in the early Middle Ages..."³ which Galileo countered when he overcame the "barren, primitive mentality...a petrified and barren system of ideas..."⁴ supposedly prevalent in Europe at the time.

Albert Einstein, for all his greatness, was obviously no historian of science. We quote him here to represent, rather, a common view of the non-specialist. The fact is, of course, that Galileo's work fit into a long-developing trend in scientific thought. To view him as a lonely revolutionary of science does violence to the facts, and insults the work of the medieval and Renaissance scientific community. It also misses the point of Galileo's true significance. Galileo's achievement lay in bringing the fruits of a long-developing tradition of science to the attention of the non-scientific world. His method and world views

¹Drake, Stillman (1957) *Discoveries and Opinions of Galileo* New York: Anchor Books, p. 3.

²Einstein, Albert, Foreword to Galileo, G. , *Dialogue Concerning the Two Chief World Systems—Ptolemaic & Copernican* (tr. Stillman Drake, 1953), second edition (1967), Berkeley: University of California Press, p. vii.

³*Ibid.*

⁴*Ibid.*, p. xi.

do not contrast with the other scientists' nearly as dramatically as they do with the non-scientists' cosmology of the age, a world view of pervasive importance to the whole culture.

To demonstrate that Galileo was clearly a man of his time and tradition, we will first briefly describe the development of science from the middle ages, showing that its goals, techniques, and observations were not all that different from Galileo's. We will compare Galileo's writings with that of a contemporary scientist, William Gilbert, emphasizing the similarities in both their attitudes towards Aristotle and their approach to scientific problems. Both Galileo and Gilbert used experiment, observations of nature, and mathematics. Gilbert's work was published in 1600, before Galileo's books, and Galileo was well aware of them; indeed he comments on them, favorably, in his popular writings.

And we will examine Galileo's writings themselves, to demonstrate that he himself often failed to carry through on his own insights into scientific principles and the scientific method. By contrast, we will argue that Galileo's greatest advance was not in his science, but in his understanding of how his science affected the world view of his culture. This was the very cause of his troubles with his Peripatetic adversaries, and with the Church. And it is the source of his fame today.

II. The Setting of Galileo as Scientist

To understand the how science had developed, leading up to Galileo, we will rely on A. C. Crombie's pioneering history, *Augustine to Galileo, Volume Two: Science in the Later Middle Ages and Early Modern Times*. Setting the scene, Crombie notes that:

Concerning the question of the purpose and nature of science, two medieval contributions may be singled out. The first is the idea, first explicitly expressed in the 13th century, that the purpose of science was to gain power over nature useful to man. The second is the idea insisted on by the theologians, that neither God's action nor man's speculation could be constrained within any particular system of scientific or philosophical thought. ... [T]he effect of this idea on natural science was to bring out the relativity of all scientific theories and the fact that they might be replaced by others more successful in fulfilling the requirements of the rational and experimental methods.

Thus the experimental and mathematical methods were a growth,

developing within the medieval system of scientific thought, which was to destroy from within and eventually to burst out from Aristotelian cosmology and physics.⁵

The importance of his first point, the purpose of science as power over nature, is that science is given already in the 13th century a role very different from that in classical times. Aristotle had considered physics as a science of pure thought, one which was useful for understanding in a metaphysical sense the nature of reality. But as such, later thinkers could easily give elegance of thought a higher priority than agreement with experiment. By tying science in with control of nature, the 13th century scientist imposed a new criterion on science: it must succeed in making nature conform to the wishes of the scientist in predictable ways.

Crombie's second point, the freedom of scientific thought from any dogma, refers to the edict of Bishop Étienne Tempier of Paris in 1277. At that time, philosophers at the University of Paris had been eagerly adopting the newly-discovered writings of the ancient Greeks, as found in Islamic libraries (notably in Toledo) recently captured from the Moors. In their rush to adopt Greek ideas, many philosophers had used Aristotle to challenge directly Church teachings. The issue eventually was settled by the writings of Aquinas; but before this Christianizing of Aristotle won the day, the conservative bishop of Paris had issued his edict of 219 propositions which could not be taught at the University of Paris. Most dealt with the "impossibility" of one proposition or another; for instance, the philosophers had used Aristotle to prove that it was impossible for the Earth to move. The bishop countered that, with God all things were possible. From this edict, Pierre Duhem has argued that modern science was born: "One can state that the excommunications delivered in Paris on March 7, 1277, by Bishop Étienne Tempier and the Doctors of Theology were the birth certificate of modern physics."⁶ Certainly, medieval natural philosophers like John Buridan (d. 1358?) and Nicole Oresme (d. 1382) did consider the implications of such ideas as the possible motion of the Earth. Duhem notes that "by supporting

⁵Crombie, A. C. (1959) *Augustine to Galileo, Vol II: Science in the Later Middle Ages and Earth Modern Times* London: Heinemann Educational Books, p. 120.

⁶Duhem, Pierre (1916) *Medieval Cosmology* (edited and translated by Roger Ariew, 1985, from *Le Système du Monde. Histoire des doctrines cosmologiques de Platon à Copernic*, originally prepared in 10 volumes) University of Chicago Press, Chicago, p. 4. However, for a dissenting view see Edward Grant, (1974) *A Source Book in Medieval Science*, Cambridge, Mass: Harvard University Press.

the hypothesis of the rotation of the earth and by destroying the Peripatetic arguments opposed to it, Oresme was a precursor of modern science; he also helped by formulating a theory of weight that made the Copernican revolution possible."⁷

This is not to say that medieval science itself was entirely free from dogmatism, or based on experiment. Crombie notes that:

[T]here can be little doubt that it was the development of these experimental and mathematical methods of the 13th and 14th centuries that at least initiated the historical movement of the Scientific Revolution culminating in the 17th century. But when all is considered, the science of Galileo, Harvey and Newton was not the same as that of Grosseteste, Albertus Magnus and Buridan. Not only were their aims sometimes subtly and sometimes obviously different and the achievements of the later science infinitely the greater; they were not in fact connected by an unbroken continuity of historical development.⁸

Crombie makes the point that, with the development of humanism in the Renaissance, the best minds of that age tended towards the study of the arts, especially literature, writing, sculpture, and painting.

Towards the end of the 14th century, the brilliant period of scholastic originality came to an end. For the next century and a half all that Paris and Oxford produced on astronomy, physics, medicine or logic were dreary epitomes of the earlier writings. One or two original thinkers like Nicholas of Cusa and Regiomontanus appeared in Germany in the 15th century. Italy fared better but rather with the new group of 'artist-engineers' like Leonardo da Vinci than in the universities. Interest and intellectual originality were directed towards literature and the plastic arts rather than towards natural science.⁹

Scientific research during the 15th century suffered, and there was not a living tradition to fall back upon when scientific issues start re-emerging in the 16th century. Still, because this medieval science was preserved in books, it did

⁷Duhem, P., , *op cit.* p. 479.

⁸Crombie, A. C., *op cit.* p. 121.

⁹*Ibid.*

have an effect on later thought:

In the conceptions of scientific method and explanation the medieval part of the ancestry is equally visible, especially for example in Galileo's use of methods of 'resolution and composition' to elucidate the relation between theory and experiment and to develop the 'Euclidean' form of scientific explanations.¹⁰

The two most notable advances that we think of as the key to the 17th century Scientific Revolution are the experimental method and the use of mathematics.

[The scientific revolution] came about by men asking questions within the range of an experimental answer, by limiting their inquiries to physical rather than metaphysical problems, concentrating their attention on accurate observation of the kinds of things there are in the natural world and the correlation of the behavior of one with another rather than on their intrinsic natures, on proximate causes rather than substantial forms, and in particular on those aspects of the physical world which would be expressed in terms of mathematics.¹¹

Crombie sees the roots of both of these developments in the medieval science. Galileo did not invent either idea:

Perhaps the most powerful feature of the medieval philosophy of science that remained strongly influential in the early 17th century was the Neoplatonic conception that nature was ultimately to be explained mainly by mathematics.¹²

However, as Crombie points out, the true revolution of the 17th century was not in the lip service given to these concepts, but rather to their implementation.

Certainly the strong interest in the theory and logic of experimental science and in related philosophical conceptions of nature, sustained from

¹⁰*Ibid.*, p. 125.

¹¹*Ibid.*, p. 131.

¹²*Ibid.*, p. 129.

Grosseteste down to the threshold of Galileo's activities, stands in striking contrast with the comparative scarcity of actual experimental investigations. This becomes intelligible if we see the medieval natural philosophers not as modern scientists *manqués* but as primarily philosophers. They gave an account of experimental inquiries often as an exercise in what could be done in one branch of philosophy in distinction from others... In what was actually found out by experiment they were less interested... certainly there was no general movement to conceive of experimental inquiry as a sustained testing of a series of precisely and quantitatively formulated hypotheses, pressing on to the reformulation of a whole area of theory... It would have become a dead end had not Galileo and his contemporaries, with a new direction of interest, pursued the subjects of the examples for their own sakes.¹³

This revolution was already well underway by the time of Galileo:

Sixteenth-century physicists turned increasingly from Aristotle's qualitative 'physical' explanations to the mathematical formulations of Archimedes and to the experimental method.... Like Archimedes, they tried to conceive of a clear hypothesis and put it to the test of experience. Thus, beginning with the assumption that perpetual motion was impossible, Simon Stevin was led to a clear appreciation of the basic principles of both hydrostatics and statics.¹⁴

Stevin [1548-1620] published his work in the 1580's, and it appears that Galileo was familiar with his work; Crombie suggests that Galileo taught classes from Stevin's work.

An interesting example of how this development of thought through the 16th century can be seen in practice, with great relevance in the case of Galileo, is the history of the question of falling bodies.

Batista Benedetti (1530-90) ...knew of the criticisms that had been made in late Greek times of Aristotle's ideas on falling bodies... He imagined a group of bodies of the same material and weight falling beside each other, first connected and then separately, and he concluded that their being in connexion could not alter their velocity. A body the size of the whole group

¹³*Ibid.*, p. 128.

¹⁴*Ibid.*, p. 143.

would, therefore, fall with the same velocity as each of its components...though he made the mistake of believing that the velocities of bodies of the same volume but different material would be proportional to their weights...

Stevin performed the experiment, also attributed to Galileo, of dropping simultaneously two leaden balls, one ten times heavier than the other, from a 30 foot height onto a plank... Similar experiments had, in fact, been mentioned in the writings of critics of Aristotle since Philoponus¹⁵... Stevin and his predecessors recognized that their observations were incompatible with the Aristotelian law of motion... But Stevin did not develop the dynamical consequences of his observations.¹⁶

Thus the issue for which Galileo has gained considerable fame from in the popular mind is, in fact, something that was well known and widely argued before him.

Galileo did not develop his thought, his methodology, or even his choice of questions, in a vacuum. He was a product of his times. His contributions were an advancement to the science of the time; but as a scientist, he was not exceptionally radical or revolutionary.

III The Scientific Attitudes of William Gilbert, A Predecessor of Galileo

William Gilbert was a British physician, an officer and eventual president of the College of Physicians, who was appointed in 1601 as physician to Queen Elizabeth. He was interested in all manners of scientific questions; he published articles on questions of navigation, collected scientific instruments and minerals, and gathered around him a group of like-minded scientists who would meet regularly to discuss issues of science. This group has been called a precursor to the Royal Society. His interest in magnetism led to nearly 20 years of study on the subject, culminating in the publication in 1600 of his major treatise, *De Magnete Magneticisque Corporibus et de Magno Magnete Tellure Physiologia Nova, or On the Magnet and Magnetic Bodies, and on the Great Magnet Earth, A New Physiology*.

The work is divided into six books. Following a preface which outlines his

scientific philosophy, he starts with an exhaustive description of previous work (mostly in antiquity) concerning magnets, and a description of naturally occurring magnets (or "lodestones"). He describes what they attract, and what they are made from. It also mentions the natural magnetic field of the Earth. The second book looks more carefully (but only qualitatively) into the strength of the magnetic force as a function of the size of the magnet and the position of the attracted body relative to the pole of the magnet. The third book discusses the direction of the attraction. The fourth book is a detailed discussion of variation, the difference between magnetic and true north, as a function of location on the Earth. The fifth book looks at magnetic dip, the tendency of the Earth's magnetic field to direct a magnet downwards as well as towards the north. It was Gilbert's hope that variation and dip could be used as tools of navigation, to solve the problem of determining latitude and longitude when clouds made celestial navigation impossible. (Unfortunately, the irregularity and changing nature of the Earth's magnetic field make such an attempt impractical.) The sixth book treats the entire Earth as a magnet, and suggests (ingeniously, but incorrectly) that the magnetism of the Earth may be responsible for the Earth's precession. In the process, Gilbert discusses and defends at length the Copernican theory of the Earth as a spinning body in orbit about the Sun.

Compared with Galileo's work, Gilbert's book is somewhat different in style. It is written in Latin, unlike all of Galileo's work after the *Starry Messenger*. It is written as a scientific treatise, rather than as a popular work. It is a book primarily of observations and instructions, so that others may repeat the experiments; Galileo's writing is far less detailed. (For instance, one could not build a telescope like Galileo's based on any instructions he provides.) Gilbert uses detailed geometrical descriptions of his instruments and observations, and he uses geometrical constructions to describe the precession of the equinoxes, but unlike Galileo he does not use mathematics to derive any new predictive laws.

Two sections of the book deserve to be examined further, the Preface and the beginning of Book Six. The Preface discusses his attitude toward doing science, and represents the thought of a prominent English gentleman some 25 years before Galileo's *Assayer*:

[I]n the discovery of secret things and in the investigation of hidden causes, stronger reasons are obtained from sure experiments and demonstrated arguments than from probable conjectures and the opinions of philosophical

¹⁵John Philoponus of Alexandria, a 6th century neo-Platonist, rejected many of Aristotle's ideas of motion including the concept that the medium in which a body moves is responsible for its continued motion. cf. Crombie, A. C., *op cit* p. 65.

¹⁶*Ibid.*, pp. 142-143.

speculators of the common sort... And even as geometry rises from certain slight and readily understood foundations to the highest and most difficult demonstrations, whereby the ingenious mind ascend above the ether: so does our magnetic doctrine and science in due order first show forth certain facts of less rare occurrence...at length, in a sort of series, are revealed things most secret and privy in the earth...

But why should I, in so vast an ocean of books whereby the minds of the studious are bemuddled and vexed—of books of the more stupid sort whereby the common herd and fellows without a spark of talent are made intoxicated, crazy, puffed up; and are led to write numerous books and to profess themselves philosophers, physicians, mathematicians, and astrologers, the while ignoring and contemning men of learning—why, I say, should I add aught further to this confused world of writings, or why should I submit this noble and (as comprising many things before unheard of) this new and inadmissible philosophy to the judgement of men who have taken oath to follow the opinions of others, to the most senseless corrupters of the arts, to lettered clowns, grammarians, sophists, spouters, and the wrongheaded rabble, to be denounced, torn to tatters and heaped with contumely. To you alone, true philosophers, ingenious minds, who not only in books but in things themselves look for knowledge, have I dedicated these foundations of magnetic science—a new style of philosophizing.

This natural philosophy is almost a new thing, unheard of before; a very few writers have simply published some meagre accounts of certain magnetic forces. Therefore we do not at all quote the ancients and the Greeks as our supporters, for neither can paltry Greek argumentation demonstrate the truth more subtly nor Greek terms more effectively, nor can both elucidate it better. Our doctrine of the loadstone is contradictory of most of the principles and axioms of the Greeks.¹⁷

This outline is very reminiscent of Galileo at his most scathing. Here we have a gentleman who is well established in the highest levels of society, who nonetheless feels it necessary to use language which today we might consider extreme. In Galileo's case, such words would be considered evidence of a hot

¹⁷Gilbert, William (1600) 'On the Loadstone and Magnetic Bodies and on the Great Magnet the Earth' (tr. P. Fleury Mottelay), in *Great Books of the Western World*, Vol. 28 (ed. R. M. Hutchins), Chicago: Encyclopædia Britannica, Inc., 1952, pp. 1-2.

temper (I am tempted to say, as evidence of a stereotypically "Italian" attitude) perhaps excused by the attacks and injustices he had endured. Such an excuse clearly does not hold in Gilbert's case. Rather, it may be that such vigorous fighting for a new philosophy was considered par for the course for scientists stepping beyond the realm of the University. (Recall that, like Galileo, Gilbert did not teach at a University but rather worked with a private academy of like-minded scientists.)

Book Six is a defence of the Copernican system, and again a very familiar tone emerges:

Among the ancients...many...held that the earth moves, that the stars set through the interposition of the earth and that they rise through the earth's giving way...the earth being, like a wheel, supported on its axis, rotates upon it from west to east...

But when philosophy had come to be handled by many, and had been given out to the public, then theories adapted to the capacity of the vulgar herd or supported with sophistical subtleties found entrance into the minds of the many, and, like a torrent, swept all before them, having gained favor with the multitude. Then were many fine discoveries of the ancients rejected and discredited...

And indeed, nature would seem to have given a motion quite in harmony with the shape of the earth, for the earth being a globe, it is far easier and far more fitting that it should revolve on its natural poles...than that there should be fashioned a sphere of the *primum mobile*—a thing not received by the ancients, and which even Aristotle never thought of or admitted as existing beyond the sphere of the fixed stars; finally, which the holy Scriptures do not recognize, as neither do they recognize a revolution of the whole firmament.¹⁸

From these quotations, two facts clearly emerge. A quarter century before Galileo's *Assayer*, another prominent scientist was vigorously attacking the old Aristotelian system and promoting the idea experiment superseding authority on scientific issues. And second, Gilbert's arguments for the Copernican system, including an appeal to Scripture in its favor, echo the same ideas expressed by

¹⁸*Ibid.*, pp. 107ff.

Galileo in the *Letter to the Grand Duchess Christina* fifteen years later. In his methods, his opinions, and even his way of expression, Galileo was in good company.¹⁹

Finally, note the scorn which Gilbert heaps upon those who write on philosophy for the “vulgar herd”. Gilbert clearly believed that natural philosophy was best left for the natural philosophers. It is a point we will return to in our conclusion.

IV. Galileo as Scientist. Did He Follow His Own Method?

One highly touted aspect of Galileo's greatness is his articulation of the modern scientific method: his emphasis on experiment, and his belief that the book of nature is “written in the language of mathematics.”²⁰

What was his method, what was this advance? Crombie discusses it from the perspective of the history of science:

Galileo's new way of looking at the facts of experience represented a change of emphasis which was all important, though each of its two main characteristics had antecedents in an earlier tradition; the proof of it was that it bore fruit in the rapid solution of many different scientific problems. First, he put aside all discussion of the ‘essential natures’ that had been the subject-matter of Aristotelian physics and concentrated on describing what he observed, that is, on the phenomena...

This attitude to such so-called causes Galileo learnt from the nominalism which had penetrated the Averroist schools of northern Italy during the 15th century. Such words as ‘gravity’, he held, were simply names for certain observed regularities, and the first business of science was not to seek unfindable ‘essences’ but to establish these regularities, to discover proximate causes, that is, those antecedent events which, when other conditions were the same, always and alone produced the given effect.

...In accordance with the logic of science of the later Middle Ages, the

¹⁹In a footnote on p. 164 of *The Crime of Galileo*, Giorgio de Santillana quotes a study showing that of 2,330 works published on astronomy between 1543 and 1687, 180 of these were Copernican. This represents 8% of the total, and it's not clear how many of the others were discussions independent of the choice of system. If not universally accepted, the Copernican theory was not universally condemned, either.

²⁰Galilei, Galileo (1623) *The Assayer* in Drake (1957), *op. cit.*, p. 238.

method of ‘resolution and composition’, he showed how to arrive at general theories by analysis from experience, to vary the conditions and isolate causes..., and to verify or falsify theories by experiment.

...Galileo's scientific method resembled that of the scholastic philosophers of Oxford and Padua who had interpreted Aristotle in terms of Plato's dialectic and had applied the *reductio ad absurdum* to empirical situations...But he made one advance of the greatest importance. He insisted, at least in principle, on making systematic, accurate measurements, so that the regularities in phenomena could be discovered quantitatively and expressed in mathematics.²¹

So we see that Crombie places Galileo squarely in a developing tradition that had its roots in scholastic philosophy. Galileo argued much the same way as they did; he used the same style of discourse and procedures which many scholastics had long held to be proper. His advance in the experimental method was not in inventing it, but rather in actually using it.

The most important feature of his innovation was probably his use of mathematics. Indeed, Galileo himself recognized that his style of science was not all that different from that of Gilbert; in the third day of the *Dialogue Concerning the Two Chief World Systems*, the character Salviati (who is Galileo's mouthpiece) encourages his companions to read Gilbert's book on magnetism and then continues, “I am merely going to explain, with a certain likeness to my own, his method of procedure in philosophizing, in order that I may stimulate you to read it.”²² But then, however, Galileo notes the difference between himself and Gilbert: “What I might have wished for in Gilbert,” says Salviati, “would be a little more of the mathematician... His reasons, candidly speaking, are not rigorous, and lack that force which must unquestionably be present in those adduced as necessary and eternal scientific conclusions.”²³

The importance of the mathematics was both that it could express and predict the rules of nature in mathematical form, and also that it could be used to suggest new crucial experiments. Crombie notes:

[T]he second main characteristic of his new approach to science...was to try

²¹Crombie, A. C., *op. cit.* p. 145 ff.

²²Galilei, Galileo (1632), in Drake (1953), *op. cit.*, p. 403.

²³*Ibid.*, p. 406.

to express the observed regularities in terms of a mathematical abstraction...

Galileo believed the mathematical theories from which he deduced the observations to represent the enduring reality, the substance, underlying phenomena. Nature was mathematical. This view he owed partly to the (Pythagorean) Platonism which had been popular in Italy, particularly in Florence, since the 15th century.

...[Galileo believed that] what was non-mathematical was subjective... In the transitional state of contemporary scientific thought his analysis of scientific method had two main purposes. On the one hand he wanted to show that the Aristotelian explanations were not explanations at all, were in fact answers to the wrong questions and totally inadequate to the problems being considered...on the other hand, he wanted to show how to find the true solutions...

By using this method of abstracting from immediate and direct experience, and by correlating observed events by means of mathematical relations which could not themselves be observed, he was led to experiments of which he could not have thought in terms of the old common-sense empiricism.

He described his method fully...in a letter to Pierre Carcavy in 1637. Since it was impossible to deal at once with all the observed properties of a phenomenon, he first reduced it intuitively to its essentials. After this 'resolution'...he set up a 'hypothetical assumption' from which he deduced the consequences that must follow. This second state he called 'composition.' Finally came an experimental analysis, which he also called 'resolution', of examples of the effect in order to test the hypothesis by comparing its deduced consequences with observation.²⁴

Experiment, observation, mathematics. These were the keys, according to Galileo himself. All of these concepts had been endorsed by the scholastic natural philosophers, but none had been combined the way Galileo proposed to. A scientist who followed his procedure might indeed earn the title of a revolutionary. Did Galileo himself actually follow this way of proceeding?

²⁴Crombie, A. C., *op cit.* p. 149 ff.

Experiment: Let us look at his use of the motion of a rolling ball to see if his arguments about motion under gravity (which are essentially correct as stated) were indeed confirmed by experiment.

The basic idea is that a body going down a slope may take longer to reach the bottom of the slope than one falling straight down from the same altitude, but by the time it gets to the bottom the body on the slope is travelling just as fast as the falling body. This is stated most elegantly in *The Two New Sciences*, day three. "If a body falls freely along smooth planes inclined at any angle whatsoever, but of the same height, the speeds with which it reaches the bottom are the same."²⁵ This is followed by Theorem III, Proposition III: "If one and the same body, starting from rest, falls along an inclined plane and also along a vertical, each having the same height, the times of descent will be to each other as the lengths of the inclined plane and the vertical..."²¹ and the same theme continues in the many theorems and problems which follow. These points are all deduced mathematically, using many clever geometric constructions.

And his conclusions are quite correct, as stated. But are they based on experiment?

What sort of equipment is he thinking of? What sort of objects is he dropping, or sending down inclined planes? He refers earlier to "a perfectly round ball"²⁶ when outlining his theory of motion in this book; and in the *Two Chief World Systems* he discusses the same idea by drawing a triangle where he states, "Now the line CA is meant to be an inclined plane, exquisitely polished and hard, upon which descends a perfectly round ball of some very hard substance."²⁷ Presumably, the use of an "exquisitely polished" plane and a "perfectly round" ball is asserted to get around any interference from friction by allowing the ball to roll perfectly. It is the natural way one would first think to set up such a problem.

Indeed, the experiment is sometimes still set up in this way today. However, Richard Feynman, Nobel Laureate in physics and Cal Tech professor, noted a problem with this sort of set-up when he described a year of teaching in Brazil in the 1960's in his book "*Surely You're Joking, Mr Feynman*":

At the end of the academic year, the students asked me to give a talk about

²⁵Galilei, Galileo (1638) "Dialogues Concerning the Two New Sciences" (tr. Henry Crew and Alfonso de Salvio), in *Great Books of the Western World*, *op. cit.*, pp. 210 ff.

²⁶*Ibid.*, p. 205.

²⁷Galilei, Galileo (1632), in Drake (1953), *op. cit.*, p. 23.

my experiences of teaching in Brazil... So I came in, carrying the elementary physics textbook that they used in the first year of college...

I held up the elementary textbook they were using. 'There are no experimental results mentioned anywhere in this book, except one place where there is a ball, rolling down an inclined plane, in which it says how far the ball got after one second, two seconds, three seconds, and so on. The numbers have 'errors' in them—that is, if you look at them, you think you're looking at experimental results, because the numbers are a little above, or a little below, the theoretical values. The book even talks about having to correct the experimental errors—very fine. The trouble is, when you calculate the value of the acceleration constant from these values, you get the right answer. But a ball rolling down an inclined plane, *if it is actually done*, has an inertia to get it to turn, and will, *if you do the experiment*, produce five-sevenths of the right answer, because of the extra energy needed to go into the rotation of the ball. Therefore this single example of experimental 'results' is obtained from a *fake* experiment. Nobody had rolled such a ball, or they would never have gotten those results!"²⁸ (original emphasis)

To rephrase it in mathematical terms: the speed of a falling ball, v , can be found from its kinetic energy, $(1/2)mv^2$, by setting the kinetic energy equal to the potential energy, mgh , where m is the mass of the ball, g is the acceleration of gravity, and h is the height the ball drops. From this, we solve for $v = \sqrt{(2gh)}$. If a body slides down a ramp, the same equations hold, the same velocity results. However, if a ball *rolls* down a ramp, some of the potential energy is changed into rolling energy, the energy needed to make the ball spin as it moves down the ramp. This energy is equal to $(1/2)I\omega^2$, where I is the moment of inertia of the rolling body $[(2/5)mr^2]$ for a solid sphere of mass m and radius r and ω is the rate at which the ball spins, equal to v/r . Thus we must equate mgh to $(1/2)mv^2$ plus $(1/2)I\omega^2$, and solve for $v = \sqrt{(10/7 gh)}$. The ball rolls more slowly by a factor of $\sqrt{(5/7)}$, or only 85% of the speed of the falling ball. Notice that this is independent of the size of the ball, the angle of the slope, or any other variable. Galileo must have been able to see a 15% difference in speeds. His theorem speaks of "time of descent", which varies as the net acceleration, and so the time of the rolling ball would be $7/5$, or 40% longer than, his predicted time.

²⁸Feynman, Richard P. (1985) *"Surely You're Joking, Mr. Feynman" Adventures of a Curious Character* New York: W. W. Norton & Co. pp. 215-216.

This error meant if Galileo expected a ball to take two seconds to roll down a ramp, it would actually take nearly three seconds.

Galileo may have even been aware of the problem involved in using rolling balls; he is very careful to refer only to "bodies falling down an incline" in the statement of the theorem. But from his earlier comments, it is strongly suggested that he was thinking of rolling bodies.

His math, which did not take rolling into account, predicted a simple rule. His experiments, if they used rolling balls, could not possibly have confirmed his prediction. Nonetheless, he published his prediction as a theorem, either in spite of, or in the absence of, contrary experimental results. So much for the primacy of experiment in Galileo's science.

Observation: In his *Letter on Sunspots*, Galileo engages in a dispute with Christopher Scheiner about the nature of the newly-discovered sunspots. Scheiner, writing under the pseudonym "Apelles", had suggested that the spots were caused by small planets passing between the Sun and Earth, while Galileo believed that they were actually spots associated with the surface of the Sun itself. One observational test would be the rate at which such spots traversed the Sun at different latitudes. If there were planets moving at some constant speed, they would take less time to travel across some short chord of the Sun's disk, at a high latitude, compared with the time to travel the full distance of the Sun's diameter if they were found at the Sun's equator. On the other hand, if the spots were affixed to a uniformly rotating ball, then the travel time should be exactly the same from limb to limb, regardless of their latitude. Galileo points this out and describes the results of his observation:

[Apelles] bases his argument on the unequal duration of visibility among the spots. Those which travel along the equator, he says, remain longer than those which travel along lines distant from the center. He produces two examples, saying that one spot remained sixteen days on the equator, while the other passed at a distance from the center and completed its course in fourteen days. I really wish I knew some way of denying this without offending Apelles, whom I wish always to respect. But having made a great number of careful observations concerning this matter, I find no occasion whatever for concluding anything except that all spots, without distinction, remain on the solar disk for the same period, which in my judgement is a little over fourteen days. I say this quite positively, and in the knowledge that anyone may easily make countless observations for himself. Nature, deaf to our entreaties, will not alter or change the course of her effects; and

those things that we are here trying to investigate have not just occurred once and then vanished, but have always proceeded and will always proceed in the same style. This should be a great restraint upon us, and ought to render us very circumspect about pronouncing on such things. We must take care that no passion—either toward others or ourselves—bends us away from our aim of pure truth.²⁹

Noble sentiments, strongly put; the observations conclusively prove Galileo correct, and Scheiner wrong. Or do they? In fact, the Sun is *not* a uniformly rotating ball. According to a leading modern handbook for amateur astronomers:

By observing the progress of spots as they are carried across the Sun's face we can measure the rotation period of the Sun. Being gaseous and not solid, the Sun does not rotate at the same rate at all latitudes. It spins most quickly at the equator, once every 25 days; this falls to about once every 28 days at latitude 45°, and near the poles it is slowest of all, once every 34 days. The average figure usually quoted, 25.38 days, refers to the rotation rate at latitude 15°. As a result of the Earth's orbital motion around the Sun, a spot takes about two days extra to return to the same place on the Sun as seen from Earth.³⁰

The fourteen days quoted by Galileo implies that the sunspots he followed were located at around 20°. If he had truly and carefully observed sunspots at a variety of latitudes, he would certainly have been able to see that spots at the equator moved across the Sun more than twelve hours faster than this rate, in defiance of both Scheiner's two quoted observations and Galileo's strongly worded "quite positive" observation. Either Galileo's observations were not anywhere near as precise as he claims, or else his observations spanned such a narrow range of latitudes that he had no business using them to refute Scheiner. (Because the average latitude of sunspots tends to move slowly, over a period of years, I suspect the latter is the case.) So much for Galileo, the careful observer.

Mathematics: Galileo is famous as the first scientist to use mathematics extensively in his demonstrations and theorems. Leaving beside the issue of

²⁹Galilei, Galileo (1613) "History and demonstrations concerning sunspots and their phenomena" in Drake (1957), *op. cit.*, pp. 135-136.

³⁰Ridpath, Ian, and Tirion, Wil (1984) *Universe Guide to Stars and Planets* New York: Universe Books, p. 288.

Kepler's works, which predate Galileo and are every bit as intensely mathematical, Galileo himself is guilty of numerous mathematical errors of all sorts in his work. These are more than just mistakes in arithmetic, which anyone (including Kepler) could make. More telling are places where he misapprehends basic mathematical principles themselves, using bad math to prove good points.

One such example occurs in the *Two World Systems*. The Aristotelians, arguing against the concept of a spinning Earth, point out that two cannons, one firing east and the other west, send their balls the same distance. If the Earth were spinning from west to east, they claim, one would expect the eastward-travelling ball to go a shorter distance, since the world would be moving underneath the ball in the ball's direction; the westward ball likewise should appear to travel farther.

Galileo's main argument, that the balls, cannons, and air are all spinning together, is of course the correct counter argument. But then he proposes that even if this were not the case, the difference in the distance travelled would be so small as to be unnoticeable, anyway:

Let us imagine ourselves to be at the equator, shooting a cannon point-blank toward the west at a target 500 yards distant... one second is longer than the time the ball is in motion. And since the diurnal revolution takes twenty-four hours, the western horizon rises fifteen degrees in an hour, or fifteen minutes of arc in a minute of time, or fifteen seconds of arc in a second of time. Now since one second is the time required for the shot, the western horizon rises in this time fifteen seconds of arc, and the target an equal amount. Hence it rises fifteen seconds of the arc of that circle whose radius is 500 yards, this being supposed to be the distance of the target from the cannon...hence the rising of the target while the ball is in motion is less than four one-hundredths—that is, one twenty-fifth—of a yard, or about an inch. Therefore just one inch would be the entire variation of a westward shot if the earth made the diurnal motion.³¹

Galileo's use of mathematics here is absurd (a point which the translator in his footnote appears to miss). The argument is correct up to the fifteen seconds of arc motion. But here Galileo makes an inexcusable mistake. He seems to believe that the distance travelled by the Earth during the flight of the cannon ball is related somehow to the 500 yard range of the ball. The true distance travelled by the Earth during this time is actually fifteen seconds of arc (or

³¹Galilei, Galileo (1632), in Drake (1953), *op. cit.*, pp. 181-182.

0.0000727 radians) times the radius of the *Earth*, about 7,000,000 yards. This is a total distance of about 500 yards. The cannon ball is travelling at about 1,000 miles per hour in this example, but at the equator the Earth spins at about 1,000 miles per hour. So if the Aristotelians were correct, the cannoner firing to the east would hit himself with his own cannon ball!

The instincts of the Aristotelians are correct—this is an absurd result, which would completely rule out the idea of a spinning Earth if one does not allow the fired cannon ball to maintain its inertial motion travelling eastward, along with the cannon, air, and everything else connected to the Earth. But Galileo misses the point of the Aristotelian's argument, and through his misapprehension of the mathematics involved comes up with a fallacious counter argument. What is worse, any reader with an intuition for the problem will suspect, right away, that Galileo's answer "feels wrong"; and in fact it is, it is grossly wrong. An Aristotelian reading this passage will rightly be highly suspicious of Galileo's calculation, and may even be able to find the fallacy in it. As a result, such a philosopher would be all the more contemptuous of Galileo's lack of common sense, and all the more suspicious of his other arguments against the Aristotelian system.

This is not an isolated case. There are at least five such mistakes in Day Two of the *Two Chief World Systems* alone! So much for Galileo the mathematician.

From these and other examples, we can realize that Galileo did not always practice the philosophy of science which he preached. His use of the scientific method was far different from his description of it. He did not always come to insights based on unprejudiced observation, experiment, or mathematics. His championing of the Copernican system did not follow from his observations, but rather preceded them³². His construction of the telescope did not follow from a systematic exploration of optics (in spite of his description to the contrary)³³. In the argument of the tides, he fails to use his own principle of momentum. His understanding of momentum and inertia, rightly claimed as his greatest advances in physics, were ideas which he himself did not fully understand.

(The fault is not entirely with Galileo the scientist here. In spite of his failures of experiment, observation, or mathematics, the truth remains that on the whole he was right more often than not, and he did stand against the opinion of the majority of scholars of his time. Rather, it might be better argued that the

fault is in Galileo the philosopher of science. His description of how he did science, and how science ought to be done, is the picture often quoted even to this day; but it is a flawed and incomplete description. In addition to reliance on experiment, observation, and mathematics, a successful scientist needs two much less tangible, but equally important, characteristics. The first is insight: the creative, unpredictable, but indispensable source of inspiration which suggests what experiments, observations, or calculations might be fruitful. This Galileo was well blessed with. And in his case, we can see that a sound insight can make up for a variety of deficiencies in the other categories.

The other quality, which is probably the rarest among good scientists, is a profound scepticism of one's own results. A scientist must be ever suspicious of the most tantalizing of hypotheses, and be able to know exactly when experiment, observation, and calculation have conclusively proved a pet theory to be wrong. This was the failing of the Aristotelians in Galileo's time; it was also, all too often, Galileo's failing. This point is raised here to further emphasize that Galileo was a man of his times, subject to the failings of those times.)

V. Conclusion: The Meaning of Galileo

The idea of Galileo, the "myth" of Galileo described in the introduction, in essence pictures him as a twentieth-century scientist trapped in a barbaric "dark age". This picture is clearly false. Galileo was not the first scientist to emphasize experiment and observation; these ideas in fact can be found in scholastic philosophy. He was not the first to oppose vigorously the dead weight of authority; Gilbert was his match in rhetoric on that count. He was not the first to fit the observations of nature into mathematical laws; Kepler clearly preceded him there. Galileo did articulate the modern ideal of the scientific method; but his own experience shows that his articulation was at best an incomplete description of how he, or any other successful scientist, behaves. And he himself consistently fell short of this fictional idea.

Nonetheless, it is Galileo—not Copernicus, or Kepler, or Gilbert—whom we look to as the turning point in the scientific revolution. And, just as a scientist must trust his instinct even before proofs can be found in experiment or observation, this is a historical instinct which deserves to be trusted. What makes Galileo so crucial?

C. S. Lewis in *The Discarded Image*, his discussion of medieval thought as a basis for the study of medieval and Renaissance literature, picks up on the

³²cf. Finocchiaro, Maurice A. (1989) *The Galileo Affair* Berkeley: University of California Press, p. 25.

³³cf. footnote 26, p. 246 of Galilei, Galileo (1623) in Drake (1957), *op. cit.*

medieval concept of hypotheses which save the appearances, and suggests that "the real reason why Copernicus raised no ripple and Galileo raised a storm, may well be that whereas the one offered a new supposal about celestial motions, the other insisted on treating this supposal as fact. If so, the real revolution consisted not in a new theory of the heavens but in a 'new theory of the nature of theory.'"³⁴

It doesn't work. As Galileo himself emphasized, Copernicus himself specifically treated his system as real, not hypothetical. Furthermore, Gilbert and the other scientists of the previous century were already setting on the structure of the Aristotelian system with sledge-hammers. Rather, the answer is to be found elsewhere in Lewis' work, in his description of what he calls the Medieval Model: "the medieval synthesis itself, the whole organisation of their theology, science, and history into a single, complex, harmonious mental Model of the Universe."³⁵ This model was the culmination of more than a thousand years of work.

[The Medievals] inherit a very heterogeneous collection of books; Judaic, Pagan, Platonic, Aristotelian, Stoical, Primitive Christian, Patristic. Or (by a different classification) chronicals, epic poems, sermons, visions, philosophical treatises, satires... If, under these conditions, one has... a great reluctance flatly to disbelieve anything in a book, then here there is obviously both an urgent need and a glorious opportunity for sorting out and tidying up. All the apparent contradictions must be harmonised. A Model must be built which will get everything in without a clash; and it can do this only by becoming intricate, by mediating its unity through a great, and finely ordered, multiplicity...

In the last age of antiquity many writers...were, perhaps half-consciously, gathering together and harmonising views of very different origin: building a syncretistic Model not only out of Platonic, Aristotelian, and Stoical, but out of Pagan and Christian elements. This Model the Middle Ages adopted and perfected... It is vast in scale, but limited and intelligible...Its contents, however rich and various, are in harmony. We see how everything links up with everything else; at one, not in flat equality, but in a hierarchical ladder...this Model of the Universe is a supreme medieval work of art...it is

³⁴Lewis, C. S. (1964) *The Discarded Image* Cambridge: Cambridge University Press, p. 16.

³⁵*Ibid.*, p. 11.

in a sense the central work, that in which most particular works were embedded, to which they constantly referred, from which they drew a great deal of their strength.³⁶

The crucial insight that Lewis offers is that this model, including but not limited to the cosmological model of Aristotle, was of greatest importance not to the philosophers and scientists but to the other thinkers of the age:

No one who has read the higher kinds of medieval and Renaissance poetry has failed to notice the amount of solid instruction—of science, philosophy, or history—that they carry.³⁷

[W]hen the poets use motives from the Model, they are not aware, as Aquinas was, of its modest epistemological status. I do not mean that they have raised the question he raises and answered it differently. More probably it has never been before their minds. They would have felt that the responsibility for their cosmological, or for their historical or religious, beliefs rested on others. It was enough for them that they were following good *auteurs*, great clerks, 'these olde wise'. Not only epistemologically but also emotionally the Model probably meant less to the great thinkers than to the poets.³⁸

When Galileo published *The Starry Messenger*, he created a sensation in scientific circles. But when he went to Rome and brought his theories into the salons of artists, poets, and theologians; when he wrote in Italian, for the educated middle classes; when, in the *Letter to the Grand Duchess Christina*, he challenged the theologians and metaphysicians on their own territory, he did something new. The "rigid tradition of the Dark ages" and the "naïve picture" that Einstein talks about Galileo overcoming was not the tradition or picture of the scientists, but that of the artists and poets.

Galileo was the first of the scientists to speak to the poets. He was the starry messenger, who brought to the attention of the rest of society the news of the new astronomy. And that astronomy was to shake the intricate foundation of their culture.

³⁶*Ibid.*, p. 11-12.

³⁷*Ibid.*, p. 198.

³⁸*Ibid.*, p. 17.



At the last possible second . . .

Gabe & Audrey Helou • 2691 Roundtree Drive • Troy, Michigan 48083
Voice: (313) 524-3298 • Data: (313) 524-9024

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Computer Geeks *R* Us

Here it is, February already. Gabe and I have been quite busy since Christmas & New Years. Last December we started receiving USENET feeds, and in January we expanded from only the alt. groups to carrying a (rather large) number of the rec., comp. and sci. groups. The result is that the hard disk is now overly stuffed and we frequently have times where there are zero bytes free. So, lots of Gabe's time is spent culling through the files, looking for things to remove to have room to let the news unpack.

Also, we have been dealing with various computer problems. For instance, we had a power glitch not that long ago that caused the computer to completely loose it's memory — and about two weeks of Gabe's work on reorganizing the hard disk, writing some new programs to help run the BBS, and generally improving the system. Recovering from that was not pleasant, but it did result in us obtaining a tape backup system. I was furious when the system crashed and I learned that he hadn't backed it up prior to optimizing it — and it was during the optimization that the power went out and we lost everything. He figured it would only take about 20 minutes to run the pro-

gram and the odds of the power going out were low enough not to warrant a 3-4 hour session of disk-swapping to back up the system. Unfortunately, the power did go out.

The tape drive is quite nice — just put in a tape, tell it when to schedule backing up, and go away. So now that isn't as much of a concern. While we were adding the tape-drive, we also replaced the 286 motherboard with a 386SX. So it is also running quite a bit faster.

We tried running DR DOS version 6.0, but after weeks of strange things happening and apparent bugs and/or conflicts with some of our programs, we deinstalled it and reverted to MS DOS. We also stopped using SuperStore (DR DOS's version of STACKER) which had the perverse effect of freeing up more disk space. It turns out that compressing small files (like those found on USENET) actually takes up more space than not compressing them. And now the system runs faster, since it no longer has to decompress things on the fly.

Gabe and Bob Trembley have started working on getting Waffle (the BBS software) to run under windows. Long term this

will be an improvement, as the BBS will not have to go off-line for long periods of time while it unpacks it's mail or does it's automatic maintenance, or while Gabe is working on it. Short term, however, it is a pain, because things still need to be configured and tested, and this means that the system needs to be checked rather frequently to make sure it hasn't hung. So, right now when we aren't home to check the system, it runs directly from DOS, but when we are home and able to deal with it, we try running under Windows.

Meanwhile, I have gone from reading library books to reading USENET, which is taking its toll. My reading time shot up to a steady 4-6 hours a day, and with that I can barely get through the groups I'm following (and it doesn't help that I'm reading alt.folklore and that has one of the highest amount of traffic of all of the net). Sometimes I feel like I'm learning something (and sometimes I am), but often I feel like I've just got to learn how to do without sleep, because there isn't enough time during the day to work, clean the house, see Gabe and read all the things I want to.

And, of course, I've been dealing with computer problems

of my own. At work and at home I've been running Ventura Publisher 4.0. At home it has been much easier to configure, since the only odd-ball thing I have is my XEROX full-page monitor. I had a few problems getting the new version to recognize it (which is undoubtedly the fault of the simply lousy drivers that were provided with it), but eventually Bob Trembley and I got it worked out. So at home I am pretty much at set.

Work, however, is another story. At home I have a 386, so everything runs at an acceptable speed and the hardware is up to the task. At work I am using a very old 286 (so old that the BIOS doesn't believe in 1.44 MB 3.5" disks!). Even though the system has 4 MB of RAM, I couldn't get Windows to run in anything other than real mode. It took two days to figure out how reconfigure the memory from Expanded to Extended (or the other way around). Then, getting Ventura installed was a pain, since I didn't have enough free disk space. Fixing that took a day and a half, and my solution was not a permanent one. I zipped up T_EX, which means that the next time someone tries to run T_EX it won't. And then I'll have to find a new solution to my lack of disk space.

Once I got Windows running under Standard Mode, and Ventura coming up under that, I mistakenly thought my problems were over. I began testing the software with our files, knowing that once Ventura 4.0 wrote to an older file, the format of the .chp file would change and versions 2.0 and 3.0 would no longer recognize it as a Ventura chapter. So, I have been careful to only work with

files I know are backed up under the previous versions. Well, the first day everything went great. The second day things went great — up until I tried to print the stuff I'd been working on. I could print only the first and second or the last and penultimate pages of any document (and no others). Saying "print current page" would do nothing unless I was on one of the above four pages. Talk about frustrating! I knew the printer was correctly set up (after all, it would print something). I then preceded to spend the remaining part of the day, and most of the next, looking through the help files, reading the Ventura and Windows manuals, and trying various settings. Eventually I ended up switching from hardware handling to software handling and fixed the problem — but I still don't know exactly why that setting works. (I know the words/commands, but I don't know what they mean.)

It was at this point, when I thought everything had been worked out, when I discovered a few more things that aren't quite right. First of all, at work I have a landscape, full page Monitorm monitor. The view has always been crisp, clear and big enough. Now the view of a page is smaller, and not everything draws on the screen. For instance, if I draw a table, the ruling lines around it may, or more likely, may not draw on the screen. The same holds true of any kind of shading for graphics. Naturally, when I'm working with boxes within boxes (none of which I can see), this becomes tiresome. I called Ventura's technical support, and they told me that this is was a problem with the Monitorm drivers, and that Monitorm is in Chapter 11. Considering that the drivers for the software were

only 3 days old when I got them, I don't think they'll be in a big hurry — or be in a position — to fix them any time soon.

Tax Season & More Hardware Problems

In past years we've used both TurboTax and Andrew Tobba's TaxCut to do our taxes on the computer. It seems to work better than doing it by hand, and I don't have to go hunting all over creation for all the forms we need.

Last year we used TaxCut, and I still haven't forgiven or forgotten the way it bounces users from screen to screen, insisting that they fill out all kinds of weird forms, just because the program thinks they might possibly need to. So, this year we started off with TurboTax, and it worked pretty well.

I had a bit of a hard time figuring out how to change forms (say from form 1040 to 8086), but that wasn't really all that tough and I didn't even refer to the manual. But when it came time to print...hoo boy! I don't have a printer hooked up directly to my machine, so I figured I'd just tell the program to print to disk, take the file to another machine and copy the file to the printer. I should have known it wouldn't be so simple. First I tried to use a Hewlett-Packard LaserJet II. Well, the machine with the printer couldn't read the floppy since the machine it was written with uses a high density drive, and the other computer can only read low (this was using a 340K disk, and it made no difference which machine formatted the disk). So, I

gave up trying to use the LaserJet. Next in line was an Epson LQ-510 dot matrix printer on a machine with a 3.5" floppy drive. So I copied the file to a 3.5" disk and went at it. The Epson did a fairly good job, except that page two of the IRS 1040 starts to low and prints the bottom 1 1/2 inches on page 3, and 0s and 8s look almost identical. And, it is *very* slow. Well, after going through all of that I really don't feel like trying to use yet another printer, so I think we'll declare it good enough to send, and hope that the IRS agrees!

Feminist Science?

As I think I wrote in a prior issue, I read Fallen Angels (by Larry Niven, Jerry Pournelle, and Michael Flynn), which I thoroughly enjoyed. Although I think *fen* would respond favorably and as creatively to the situations described in the book, some things that I have recently come across in *sci.skeptic* have reminded me of Fallen Angels a little too well.

To give a quick recap of the book, the earth is in the midst of another ice age, brought on by a response to pollution. The Green way of thinking becomes the only politically correct, and socially acceptable way to think. Scientific thought becomes dangerous to both one's health and career. A manned space station exists in orbit, however, the people onboard are regarded as traitors who are responsible for the sorry state the earth is in. Into this fearsome environment come two of these astronauts who have crash-landed during a mission to atmospheric levels. Fandom joins together to find them and keep them from being captured by the government

and attempt to return them to space.

My two favorite quotes from Fallen Angels are:

"Ice is crystal and crystals focus the life power. Yes, yes, I know people have frozen on the Ice in spite of that; but all sickness comes from negative thinking. One must be open to the life-affirming powers of the crystal."

and

"He said that the alleged objectivity of materialist science was an invention of heterosexual, white males, so we shouldn't use that as a basis for judgement."

Both quotes give a quick look at the level of regard shown for scientific thought (in Fallen Angels).

Well, this kind of thinking is fairly common, if what I've been seeing on USENET is any indication. On *sci.skeptic* we've recently had someone claiming that firewalking cannot be explained by science and has some mystical properties that cannot be measured (which reminds me far too much of "crystal powers") and we've had what looks to be the beginnings of a long thread on Feminist Science.

I am going to quote from four posts on Feminist Science, and extensively from the ones by Michael Tobis and Brian Siano, because I think they do a much better job of explaining what is going on than I can do. I apologize for the length, but I think you will

find them interesting as well as educational.

sheaffer@netcom.COM
(Robert Sheaffer) asks:

Could anyone enlighten me as to what "feminist physics" or "feminist astronomy" might be? Is it supposed to be a scientific movement? A political one? Can non-feminists do feminist science? Can feminists do non-feminist science?

Michael Tobis then follows with:

Feminists can (and do) do real science. Feminist science is the feminist version of afrocetric science - rewriting science to conform to feminist theory. The first clue should be that many of their prominent advocates denounce logic as a tool of the patriarchy.

... Some very excellent scientists describe themselves as feminists, of this I have no doubt. Also, it is a serious mistake to minimize or deny the disincentives to girls and younger women to seriously study math and science, nor to deny the presence of blatantly sexist older men in the institutions governing science and engineering who tend to ignore or deny the capacities of women scientists.

That said, and as much as I hate to support the National Review, no bastion of

objectivity itself, a criticism of “feminist science” is quite distinct from a criticism of scientists who are feminists. “Feminist science” is a demand of the radical feminist branch of academic “theory” (I use the word loosely) who think the accomplishments of western civilization are so trivial compared to the flaws of it that western civilization should only be considered as the principal origin of evil in the world (unfortunately, the right wing is NOT exaggerating the position, although they may be exaggerating the extent of its influence, I’m not sure) Now they propose to attack science, and seeing that “patriarchal” science uses objectivity as its first line of defense, many radical feminist academics choose to attack the concept of objectivity itself.

They claim that since perfect objectivity is impossible (reasonable enough premise) that we should forget about it, and try to find politically “progressive” positions for ALL sciences, including physics, chemistry, and astronomy.

...A specific denunciation of symbolic logic is

Words of Power: A Feminist Reading in the History of Logic, Andrea Nye, Routledge Press, 1990.

A more general condemnation of “patriarchal” science is

Whose Science? Whose Knowledge?, Sandra Harding, Cornell U. Press, 1991.

There is a specific call for “feminist physics” on p. 56, and an extension of the argument to astronomy and chemistry on p. 81.

Each of these books have extensive bibliographies, if you are looking for more of the same. The sociology journals are full of this stuff.

It’s this material that prompted me to start the related thread, “sociology vs. science” in this group. I first got worried about this subject when a good, decent, intelligent, pleasant, well-read woman who considers herself a “deconstructionist” rolled her eyes when I attempted to explain the second law of thermodynamics, and called it “a myth, as good as any other myth”, saying “oh, you scientists are so attached to your dogma...”. (She is not a specialist in sociology or philosophy of science, she was just agreeing with the post-modern synthesis. These ideas are becoming fairly widespread.)

(Brian ‘Rev P-K’ Siano) writes:

So let’s keep this distinction in mind; criticizing the institutions of science doesn’t discredit the

method, and criticisms of the method shouldn’t rest upon criticisms of the institutions. Geez, that’s profound, isn’t it?

The problem is that the people who disturb me (and probably the people who disturb Michael) do not themselves make a clear distinction between the two. To them, science as a social construct is all that there is. The laws of thermodynamics to them are indeed as arbitrary as the rule that says you should stick your pinky out when drinking tea. Only a fairly rough perusal of the sources that have been given should suffice to show that a substantial number of people in the academic community really, truly, honestly, seriously view the world this way.

A more complete version of the Second Law deconstruction goes something like this. The Second Law was developed in the historical context of the Industrial Revolution to relate to steam engines. Steam engines, of course, are instruments of power, and therefore instruments of the oppression of the Industrial Revolution. They are large and expensive, which of course concentrates their power in the hands of the wealthy oppressors, which are of course White Males. They require enormous amounts of fuel, most of which is mined by workers who are

forced to work under unspeakably degrading conditions. The Second Law and the Carnot efficiency limit were invented, therefore, to enforce and provide a justification for these oppressive conditions. Without the Carnot limit, of course, ordinary people could themselves wield the power of the steam engine in small, easy-to-use packages that require very little fuel. It was to prevent this empowerment of the People that the laws of thermodynamics were invented.

If you think that my summary is a caricature solely intended to discredit deconstructionists, and that nobody with academic standing really believes anything like this, go though some of the books that have been listed.

This is indeed a good summary of the beliefs that are proposed in the name of "socially progressive science", but you will have a hard time finding such beliefs expressed by them in such a succinct and transparently refutable way. In fact, nothing so specific as a particular result is deconstructed.

While scientists develop skill in reason, it seems, others less inclined in that direction develop skills in obfuscation. Take the following paragraph in Whose Science? Whose

Knowledge? by Sandra Harding.

Even though there are no complete, whole humans visible as overt objects of study in astronomy, physics, and chemistry, one cannot assume that no social values, no human hopes and aspirations, are present in human thought about nature.

Consequently, feminism can have important points to make about how gender relations have shaped the origins, the problematics, the decisions about what to count as evidence, social meanings of nature and inquiry, and consequences of scientific activity. In short, we could begin to understand better how social projects can shape the results of research in the natural sciences if we gave up the false belief that because of their nonhuman subject matter the natural sciences can produce impartial, disinterested, value-neutral accounts of a nature completely separate from human history.

Hmmm. A little unusual, perhaps, but is it really so wrong-headed?

Shall we deconstruct this? What's good for the gander, after all...

Even though there are no complete, whole humans visible as overt objects of study in astronomy, physics, and chemistry, one cannot assume that no social values, no human

hopes and aspirations, are present in human thought about nature.

It is impossible to prove that no errors have been made in the physical sciences which were motivated by socially formed concerns of the participants.

OK, fair enough. Shall we discuss how significant these errors are, and how they tend to be eliminated by objective evaluation procedures? Read on.

Consequently, feminism can have important points to make about how gender relations

OK, now we assume that since we can't prove that science has never made social errors, the physical sciences MUST have made such errors, and since gender is so important to our social existence, it must be central to these errors. Right?

have shaped the origins, the problematics,

Hmmm. It's true that there haven't been a lot of female scientists, and that sexual stereotyping has certainly affected this. But the origins of the problems? Just what would "feminist" chemistry propose as a problem anyway?

Specifics are never offered, merely the certainty that there would be different problems. After all, there have been significant inputs

into psychology and anthropology from feminists. Surely chemistry is no different!

the decisions about what to count as evidence,

I don't know about you, I find no excuse for this nugget myself!

social meanings of nature and inquiry, and consequences of scientific activity.

Now there is certainly much to argue on these points. However, there is no perception here that these points, while related to science, are not in themselves science.

In short, we could begin to understand better how social projects can shape the results of research in the natural sciences

OK, in the first sentence it was a hypothesis. Two sentences later it's a fact. The RESULTS of science ARE shaped by social pressures. This is the type of proof by innuendo you will find in this material.

if we gave up the false belief

FALSE belief. Well, since evidence and reason are of no use in determining the truth or falsity of statement, perhaps I have to accept this as true. There's no point in bringing up any counterevidence, is there? Anyway, there's quite a FEW beliefs, rather than one, so let's consider them individually:

that because of their nonhuman subject matter the natural sciences can produce impartial, disinterested, value-neutral accounts of a nature completely separate from human history.

impartial:

No mention of objective tests, replicability, objective measurements, hypotheses, predictions and verifications.

disinterested:

Well, this is a straw person. (-) No one ever claimed that scientists were disinterested in the success or failure of their own theories.

value neutral:

Undefined, and pretty vague as far as I can tell. The implication, I guess, is that all interpretations of nature carry a political program, so you might as well be up front about it. That's the best I can figure it.

completely separate from human history:

Of course scientific theory is closely tied to its history. That's why so much attention is paid to who discovered what and under what circumstances. Galileo isn't counting his citations any more.

Of course, since one would be a fool to claim

that because of their nonhuman subject matter the natural sciences can produce impartial, disinterested, value-neutral accounts of a nature completely separate from human history

(since the disinterested and separate from history hypotheses are easily disproven) it follows that science is not (impartial) AND (disinterested) AND (value-neutral) AND (separate from history) .

Does this prove that science is not (impartial) OR (disinterested) OR (value-neutral) OR (separate from history) ?

I guess it depends who taught you how to think.

Now I've just spent a half hour on one paragraph. The book contains a few thousand paragraphs of like coherence and clarity, and there are many similar books to choose from. Since those of us who know better don't have the time to pick apart every paragraph in detail, and since they SOUND reasonable if read quickly, many people will go on believing that science is socially constructed. I think these ideas are pretty dangerous, myself.

sheaffer@netcom.com
(Robert Sheaffer) writes:

I don't have the reference at hand right now, but I have seen a quote from a "feminist science" text complaining that Newton's

"Principia" is, in effect, a "rape manual" for Mother Nature, reflecting the male viewpoint that Nature is to be scrutinized, manipulated, used to one's advantage, etc. etc. And that's just *one* statement, there are plenty more like it.

Well, after reading all of this (and there's lots more like it on sci.skeptic), you can see why it reminds me of the political climate in *Fallen Angels*. And I don't even have the luxury of telling myself that it's only fiction so I shouldn't worry about it.

The sad thing is that I think a lot of people don't have the background to be able to appreciate what comprises "scientific thought." My own background didn't prepare me for this. I have had very little real science (I am not among those who consider Psychology to be a true science) since *Junior High School*! Although I am quite well read, I don't read many books that involve scientific theory. If it weren't for a graduate class in History and Systems of Psychology (which traced the beginnings of psychology from the early Greek philosophers to modern times, and dealt very heavily with scientific thought and how things can be known and/or discovered), I don't think I'd have the necessary framework for a critical analysis and discussion of "feminist science."

I think this topic ties in nicely with recent press-bashings of American workers and the so-called "future" of the American economy in the service industry.

Gabe told me that he heard someone say that Americans have gone from building cars for other people to driving those cars. I fear this is true, and I don't think it speaks well for the American people.

Recently, I had a chat with one of the engineers who also works for EMRC. He is from India, but his children were born here. He was lamenting the fact that his children don't think he knows anything about what it takes to succeed (despite a Ph.D.). Dr. Kabir tells me that although his kids aren't getting the best grades, they have wonderful self-esteem. Much better than he had at their age. But he is afraid that their self-confidence will end up hurting them because his kids don't feel like there is a lot of stuff they need to learn. They are perfect the way there are, so why bother?

Another thing he mentioned was that in India, learning is very much memorization of facts and figures. Here, his children are taught to reason out answers. But what he sees are a bunch of children "who can reason but whose database is empty." They have the skills to find answers, but they do not have the facts and figures that will prove or disprove their reasoning.

A Few Words Before #77 is Put to Bed

Everyone — Sorry it took so long to get this issue out. Between computer problems and taxes, I've been pulling my hair out. With some luck next issue will go out on time. I promise to give it my best shot...

Everyone, Again — Susanah West and Dave Powell have included an issue of *Hobson's Choice* with their zine with the hope that they will receive critical reviews of it.

Guy C — you did an excellent job putting your contribution together. By wrapping every other segment, telling how much of the stack is one complete article will be a breeze. Thanks! This is the best method I've seen yet for preparing a contribution.

Bill Higgins — I saw your post in alt.folklore.computers concerning the "Three-inch algorithm." Pretty funny! I could almost hear you tell it.

Bob & Connie — What's for dinner? When are you going to write something? (Nag, nag, nag.)

THX (er, I mean, Scott) we'll see you and your lovely wife on the first of the month. Sorry you had to wait so long for a review of your work, but hopefully the wait was worth it. (I always read your stuff and usually like it, but I don't have much else constructive to say. Except keep writing, of course!)

Valli & Joa — Hope to see both of you real soon. How about stopping by next time you come to Michigan to pick up your mail?

Last and Least...

On the reverse of this page you will find an article which I have been meaning to include with my zine for the longest time. I've been saving it since last October, when to keep it safe, I put it in my desk. You know what they say — out of sight is out of mind...

+ Cartomaniac has a thing about maps

+ BY THOMAS SWICK
Fort Lauderdale Sun-Sentinel

There's been a lot of talk these days about the map business — how cartographers are having to revise their maps, how they have to check the paper each morning before starting to work.

New countries are sprouting, old cities are changing names, borders are disappearing here and emerging there.

Even I felt a small twinge of excitement a few weeks ago when, writing out a map order for the graphics department, I deleted Leningrad and typed in St. Petersburg. It was like bringing a city back from the dead.

With all the cartographic confusion in the air, I decided to give Siegfried Feller a call.

Feller is not a cartographer but a cartomaniac, which is to say he's mad about maps. About five years ago he channeled his enthusiasm into a newsletter called, appropriately, *Cartomania*.

It started, he says, with a few friends, "all of us senior citizens, or close to it." It's grown to 270 subscribers.

A copy of the special military issue made its way onto my desk. Printed tightly on nine stapled pages were

maps and graphs, a progress report, member news, reviews and announcements. There was a personal note from the editor, signed: "Cartomaniacally yours, Siegfried Feller."

I reached Feller at his home in Pelham, Mass. (The masthead of *Cartomania* carries a simplified map of Massachusetts, in which the only place identified is Pelham.)

"So what do you think of the international situation?" I asked.

"Oh, that doesn't faze me," he said calmly. "Cartographers have had the same problems before, when the African nations separated from their colonial rulers. It's nothing new.

"And," he continued, "what I do is by no means scholarly. It's for hobbyists and collectors, most of whom are not that interested in new maps anyway."

Feller had just come back from New York City, where he purchased 71 maps at the Pageant Bookstore. He also had interviewed, for an upcoming issue, Oliver Williams, the artist who creates the decorative maps in *European Travel & Life*.

Feller's full-time job is director of collection development at the University of Massachusetts library. What is it that makes me think this library must

have an excellent map section?

Feller's collection is not confined to the traditional fold-up maps, or even the decorative, antique maps that sometimes feature human faces with expanded cheeks portraying winds — though, of course, Feller has his share of those.

He also has about 7,000 postcards with maps, more than 80 of them maps of Cape Cod. He has a collection of maps on postage stamps. And matchbook covers.

"Often you'll go to restaurants where they give away matches that carry a small diagram of their location." He has more than 1,000 of those. Some people, he said, collect ashtrays in the shape of states. "It gets to be pretty frivolous," he said. How frivolous, you ask?

"At our last meeting," Feller said, "we had about 130 slides of maps in different formats. Maps on book jackets — somebody had a book with a map printed inside the jacket — on saucers, on cups, on coffee mugs."

For copies of Cartomania, write to Siegfried Feller, Association of Map Memorabilia Collectors, 8 Amherst Road, Pelham, Mass. 01002.